

Attachment AA

to

Stephen West Complaint

Dr. David Lubarsky 2007 Affidavit

AFFIDAVIT OF DAVID A. LUBARSKY, M.D., M.B.A.

Comes now the affiant, David A. Lubarsky, M.D., M.B.A., and declares under the penalty of perjury all as follows:

1. My name is David A. Lubarsky. I live in Miami, Florida.
2. I graduated from Washington University with a B.S. in 1980 and an M.D. in 1984. I also hold an M.B.A. from Duke University (1999).
3. I am licensed to practice medicine in New York (1985), North Carolina (1988) and Florida (2002). I moved from North Carolina to Florida, and while applying for a full license, in 2001, and early 2002, held a Florida Board of Medicine Medical Faculty Certificate.
4. I am board certified by the National Board of Medical Examiners, the American Board of Anesthesiology (placing in the 99th percentile on Part I of its examination), and have completed the American Board of Anesthesiology Maintenance of Certification Exam (2004) and am certified by the American Academy of Pain Management.
5. I serve as the Emanuel M. Papper Professor and Chairman, Department of Anesthesiology, University of Miami School of Medicine, with a secondary academic appointment as Professor, Department of Management, University of Miami School of Business.

6. I have published, as author and co-author, 127 books, chapters, monographs, journal articles, and other publications or abstracts, primarily in the area of anesthesiology. I have also made video presentations and other private-sector publications, contributed to conference proceedings and newsletters and created electronic World Wide Web, and/or Internet publications related to my work.

7. I have lectured, appeared on panels, and served as a visiting professor throughout the United States and in Paris, Hong Kong and Japan.

8. I have been retained as an expert witness in approximately 30 malpractice cases and given about 10 depositions.

9. My credentials are set forth in greater detail in the curriculum vitae, a true and correct copy of which is attached hereto, incorporated herein, and marked as Lubarsky Exhibit 1.

10. Together with Leonidas Koniaris, M.D., Teresa A. Zimmers, Ph.D., and Jonathan P. Sheldon, J.D., I conducted the research and reported the findings contained in "Inadequate anesthesia in lethal injection for execution" in THE LANCET, volume 365, pages 1412-14, published on April 16, 2005, a true and correct copy of which is attached hereto, incorporated herein, and marked as Lubarsky Exhibit 2.

11. THE LANCET is one of the most prestigious medical journals in the world. All publications go through a rigorous process of review for both pertinence and scientific method. Usually at least two reviewers eminent in the field being investigated provide input to an editor in charge of the section in which the paper will be published. Among the methods evaluated are how data were collected, and statistical analysis of that data. Furthermore, conclusions are carefully monitored for faithfulness to the data described in the paper.

12. Our research dealt with the process of injecting a person sentenced to death with a succession of three chemicals: thiopental (also known as sodium pentothal), pancuronium bromide, and potassium chloride, and raised the question whether the levels of thiopental in the bloodstream of the person being executed were high enough to produce unconsciousness throughout the execution and whether the protocols provided by Texas and Virginia would absolutely produce a foolproof method of humane execution.

13. Each of the propositions of fact set forth in the LANCET article as aforesaid reflects my opinion to a reasonable degree of scientific certainty.

14. Based on our research, the article concludes that toxicology reports from the four lethal injection jurisdictions which provided them showed that postmortem concentrations of thiopental (sodium pentothal) in the blood of persons who had been executed were lower than that required for surgery in 43 of

49 cases reported (88%), and 21 (43%) inmates had concentrations consistent with awareness. This conclusion reflects my opinion to a reasonable degree of scientific certainty.

15. In light of my research and conclusions from the LANCET article, I have reviewed the protocol for execution of a death sentence in Tennessee, including interrogatory answers and deposition excerpts of Warden Ricky Bell, a memorandum opinion in the case of *Abdur'Rahman v. Sundquist*, the Tennessee Supreme Court opinion in *Abdur'Rahman v. Bredesen*, a physician's order for James L. Jones, and the autopsy of Robert Coe.

16. According to the response of Warden Ricky Bell to interrogatories in the case of *Abu-Ali Abdur'Rahman v. Sundquist*, it appears that three different drugs are employed: 5 grams of sodium pentothal, also known as thiopental; 10 mg pancuronium bromide (10 10cc vials containing 1 mg pancuronium bromide); and 100cc injectable solution of potassium chloride.

17. As an initial matter, the description of the drugs involved highlights the type of confusion and error in the mixing and administration of drugs which can lead to inadequate anesthesia. For instance, the Warden's response indicates that 5 grams (5000 milligrams) of sodium pentothal, also known as thiopental, is administered in a 50cc, or 50 ml, solution. The concentration of the thiopental, therefore, is 100 mg/ml. Thiopental, however, is never mixed in that fashion, and

the physician's order is for 5 grams in a 25 mg/ml solution (which is the standard mixing concentration). It is not clear that thiopental can be reliably mixed at 100mg/ml.

18. Thiopental, is an ultra-short acting substance which produces shallow anesthesia. Pancuronium bromide is not an anesthetic. It is a paralytic agent, which stops breathing. It has two contradictory effects: first, it causes the person to whom it is applied to suffer suffocation when the lungs stop moving; second, it prevents the person from manifesting this suffering, or any other sensation, by facial expression, hand movement, or speech. The third chemical, potassium chloride, burns intensely as it courses through the veins toward the heart. It also causes massive muscle cramping.

19. Thus, adequate anesthesia is necessary to mitigate the suffering of the condemned. If adequate anesthesia has not been administered, or does not get to the patient, or wears off during the procedure, the condemned will feel the pain caused by the suffocation and administration of the potassium chloride. However, the condemned will be unable to communicate his pain because the pancuronium bromide has paralyzed his face, his arms, and his entire body so that he cannot express himself either verbally or otherwise.

20. The Coe autopsy shows the level of thiopental to be 10200ng/ml, which is .0102 mg/ml, which is 10.2 mg/L. This means that assuming post mortem

thiopental levels reflect those at death, which, according to an extensive review of the medical literature they do, Mr. Coe was probably awake, suffocating in silence, and felt the searing pain of injection of intravenous potassium chloride. The drug level in Mr. Coe is entirely consistent with a thiopental underdose if the warden had administered a single 50cc syringe with the concentration ordered by the physician - i.e. $\frac{1}{4}$ of the intended dose, and one which would clearly be insufficient to last through the execution process.

21. With a reasonable degree of medical certainty, the post mortem drug levels of thiopental measured in Mr. Coe would not be sufficient to produce unconsciousness or anesthesia.

22. Drugs that are sequestered in the body tissues as thiopental is undergo a post mortem redistribution that is slight and likely to increase blood levels compared to actual levels at death. This means that the post mortem levels are actually higher than those at death, meaning that the inadequate levels of anesthesia predicted by Mr. Coe's autopsy were even more inadequate at the time of death.

23. While the correctional officials might deem the injection of medications as proof of anesthesia, this is a false notion. It is only by continuously measuring effect that one can conclude that anesthesia is present. That is the reason that animal euthanasia protocols prohibit the use of pancuronium as it

masks the awakening of the animal. That is the reason continuous presence of a highly trained individual is necessary during surgery. Merely pushing a syringe into an intravenous line is no guarantee that the drug will reach the intended recipient, nor that the recipient will experience the desired effect.

24. I conclude, given the Tennessee protocol, and to a reasonable degree of scientific certainty, that a person subjected to the protocol would very possibly not be adequately anesthetized and would have a reasonably high chance of suffering a cruel and inhumane death, for the reasons set forth in "Inadequate anesthesia in lethal injection for execution" in THE LANCET, as aforesaid.

Further, the affiant saith naught.

I declare under penalty of perjury that the foregoing is true and correct.



David A. Lubarsky, M.D., M.B.A.
Emanuel M. Papper Professor and Chair
Department of Anesthesiology,
Perioperative Medicine and Pain Management
University of Miami Miller School of Medicine
and
Professor
Department of Management
University of Miami School of Business

Exhibit 1 to Dr. David Lubarsky 2007 Affidavit

**UNIVERSITY OF MIAMI
CURRICULUM VITAE**

Date: April 2006

PERSONAL

Name: David Alan Lubarsky, M.D., M.B.A.

Office phone: (305) 585-7037

Office address: Jackson Health System
1611 NW 12th Avenue, C301
Miami, Florida 33136

Date of birth: August 2, 1959

Place of birth: New York, NY

Present academic rank and title:

Primary academic appointment: Emanuel M. Papper Professor and Chairman
Department of Anesthesiology
Professor of Anesthesiology, with tenure
University of Miami School of Medicine

Secondary academic appointment: Professor
Department of Management
University of Miami School of Business

Citizenship: U.S.A.

HIGHER EDUCATION

Washington University, St. Louis, MO, May, 1980, B.A.

Washington University School of Medicine, St. Louis, MO, May, 1984, M.D.

Fuqua School of Business, Duke University, Durham, NC, August, 1999, M.B.A.

Medical licensure: November, 2002 - Florida State License #ME86449
December, 2001-Florida Board of Medicine
Medical Faculty Certificate-Number: 1457
July, 1988-North Carolina State License #32774
July, 1985-New York State License #162663-1

Certification: National Board of Medical Examiners-July, 1985
Part I American Board of Anesthesiology (99th%) -July, 1987
Part II Board Certification-October, 1988
Recertified American Board of Anesthesiology - July 2004
American Academy of Pain Management-1991

Previous Academic Appointments

Professor (with tenure) and Vice-Chairman,
Chief Division of General, Vascular and Transplant Anesthesia and Surgical Intensive Care
Department of Anesthesiology,
Duke University Medical Center
July 1988 - November 2001

Adjunct Professor, Fuqua School of Business, Duke University 6/2000-6/2002

Academic training:

Weekend Executive Masters in Business Administration (WEMBA) Program
The Fuqua School of Business
Duke University
January 1998 - August 1999
Honored as Fuqua Scholar (top of class)

Fellowship in Transesophageal Echocardiography
Duke University Medical Center
Fiona M. Clements, M.D., Chief, Division of Cardiac Anesthesiology
Joseph A. Kisslo, M.D., Director, Echocardiography Lab
October 1992-December 1992

Fellowship in Cardiac and Vascular Anesthesia and Clinical Research
New York University Medical Center
Stephen Thomas, M.D., Division Head
July 1987-June 1988

Residency
Department of Anesthesiology
New York University Medical Center
Herman Turndorf, M.D., Professor and Chairman
July 1985-June 1987

Internship
Department of Medicine
Westchester County Medical Center
Richard Levere, M.D., Chairman
July 1984-June 1985

Publications**Books published:**

1. Robertson KM, Lubarsky DA, Ranasinghe S: Anesthesiology Pearls of Wisdom 2nd edition. New York, NY: McGraw Hill, 2005. p. 1 - 431.

2. Thiemann LJ, Robertson KM, Lubarsky DA, Ranasinghe S: Pearls of Wisdom Nurse Anesthetist Exam Review. New York, NY: McGraw Hill, 2005. p. 1- 425.
3. Gallagher C, Martinez-Ruiz R, Lubarsky DA: Procedures in Anesthesia. McGraw Hill Publishing. (In press 2006)
4. Robertson KM, Lubarsky DA: Preparing for the Written Boards: Pearls of Wisdom. Boston Medical Publishing, June 2001.
5. Gallagher CJ, Hill SE, Lubarsky DA: Board Stiff Too: Preparing for the Anesthesia Orals. Boston, Butterworth-Heinemann, 2000.
6. Lubarsky DA: The Answer Key to the Written Boards. Durham, NC, A+ Homeprep, 1992, 2nd edition 1993, 3rd edition 1994, 4th edition 1995.
7. Gallagher CJ, Lubarsky DA: Preparing for the Anesthesia Orals: Board Stiff. Boston, Butterworths, 1990.

Book chapters and monographs published:

1. Ellis J, Roizen M, Mantha S, Schwartz G, McKinsey J, Lubarsky D, Kenaan C: Anesthesia for Vascular Surgery. Clinical Anesthesia 5th Edition, Lippincott Williams & Wilkins Publishing, June 24, 2005, Chapter 32:933 - 73.
2. Lubarsky DA and Locke J, Ambulatory Anesthesia Billing, Ambulatory Anesthesia & Perioperative Analgesia Manual, McGraw-Hill Companies, 2005, Chapter 12:115 - 122.
3. J.G Reves, Peter S.A. Glass, David A. Lubarsky, Matthew D. McEvoy: Intravenous Nonopioid Anesthetics. Miller's Anesthesia 6th Edition, Elsevier Publishing, 2004 chapter 10.
4. Gayer S and Lubarsky DA: Cost-effective Anti-emesis. In International Anesthesiology Clinics: Post-operative nausea and Vomiting 2003 Vol 41(4):145-164.
5. Knudsen NW, Sebastian MW, Lubarsky DA: Cost containment in vascular surgery. Seminars in Cardiothoracic and Vascular Anesthesia 2000 (November) Vol 4(4):256-264.
6. Rock P, Lubarsky DA: The business of perioperative medicine. Anesthesiology Clinics of North America 18(3):677-698, 2000.
7. Reves JG, Glass PSA, Lubarsky DA: Nonbarbiturate intravenous anesthetics, Anesthesia, fifth edition. Edited by Miller RD. New York, Churchill Livingstone, pp 228-272, 2000.
8. Dear GdeL, Panten RR, Lubarsky DA: Operating room information systems, Seminars in Anesthesia, Perioperative Medicine and Pain. Edited by Katz RL and Ward DS. Vol 18, No 4 (December), pp 322-333, 1999.
9. Lubarsky DA: How to write clinical guidelines for value-based anesthesia care,

Anesthesia Practice Management: How to Assess and Promote Value. Monograph of the Ad Hoc Committee on Value-Based Anesthesia Care. Copyright American Society of Anesthesiologists, 1999.

10. Tardiff BE, Jollis JG, Lubarsky DA: Use of information systems and large databases in cardiovascular medicine, Outcome Measurements in Cardiovascular Medicine. Edited by Tuman KJ. Lippincott Williams & Wilkins, pp 67-80, 1999.
11. Lineberger CK, Lubarsky DA: Anesthesia for carotid endarterectomy. *Curr Opin Anaesthesiol* 11:479-484, 1998.
12. Panten RR, Dear GdeL, Lubarsky DA: Pharmacoeconomics and practice guidelines: Moving toward value-based care, Problems in Anesthesia, Vol. 10, No. 3. Edited by Arens JF, Prough DS. Baltimore, Williams & Wilkins, pp 285-291, 1998.
13. Inge WW, Grichnik KP, Lineberger CK, Lubarsky DA: Vascular surgery in the geriatric patient, Geriatric Anesthesiology. Edited by McLeskey CH. Baltimore, Williams & Wilkins, pp 637-644, 1997.
14. Lubarsky DA, Moskop RJ: The "niche" of etomidate in current anesthetic practice, Progress in Anesthesia. Edited by Eisenkraft JB. Philadelphia, WB Saunders, pp 155-168, 1994.
15. Reves JG, Glass PSA, Lubarsky DA: Nonbarbiturate intravenous anesthetics, Anesthesia, Fourth edition. Edited by Miller RD. New York, Churchill Livingstone, pp 247-289, 1994.
16. Gallagher C, Sladen RN, Lubarsky DA: Thoracotomy: postoperative complications, Problems in Anesthesia: Thoracic Anesthesia, Vol. 4, No. 2, June 1990. Edited by Brodsky JB. Philadelphia, JP Lippincott, pp 393-415, 1990.
17. Lubarsky DA, Rodman R: Carotid endarterectomy: General versus regional anesthesia, Problems in Anesthesia: Cardiovascular Anesthesia, Vol. 1, No. 3, July-September 1987. Edited by Thomas SJ. Philadelphia, JP Lippincott, pp 496-510, 1987.

Journals:

1. Abouleish AE, Prough AD, Lubarsky DA: Unintended Consequences? Unanswered Questions? *Anesth Analg*, 2006;102: xxx-xxx (In publication)
2. Vigoda MM, Lubarsky DA: Failure to Recognize Loss of Incoming Data into an Anesthesia Record Keeping System Increased Medical Liability. *Anesth Analg*, 2006 (In publication)
3. Dexter F, Lubarsky DA: Evidence-based Management Assessment of Return on Investment from Anesthesia Information Management Systems. *AANA Journal*, June 2006 (in publication)
4. Koniaris LG, Zimmers TA, Lubarsky DA, Sheldon JP: Evidence of Inadequate Anesthesia in Lethal Injection for Execution. *The Lancet* 2005, vol. 365; 9428:1412-1414.

5. **Lubarsky D, Reves JG; Effect of Subspecialty Organization of an Academic Department of Anesthesiology on Faculty Perceptions of the Workplace. *Jamcollsurg* 2005, vol. 201; 3:434-437.**
6. **Candiotti K, Kamat A, Barach P, Nhuch F, Lubarsky D, Birnbach D; Emergency Preparedness for Biological and Chemical Incidents - A Survey of Anesthesiology Residency Programs in the United States. *Anesth Analg* 2005 101:1135-1140.**
7. **Olson RP, Stone A, Lubarsky D; Prevalence and Significance of Low Preoperative Hemoglobin in ASA 1 or 2 Outpatient Surgery Candidates. *Anesth Analg* 2005, 101:1337-1340.**
8. **Candiotti KA, Birnbach DJ, Lubarsky DA, Nhuch F, Kamat A, Koch WH, Nikoloff M, Wu L, Andrews D; The Impact of Pharmacogenomics on Postoperative Nausea and Vomiting. *Anesthesiology* 2005 102:543-549.**
9. **Wachtel RE, Dexter F, Lubarsky D: Financial Implications of a Hospital's Specialization in Rare Physiologically Complex Surgical Procedures. *Anesthesiology* 2005 103(1); 161-167.**
10. **Lubarsky D: Incentivize Everything, Incentivize Nothing. *Anesth Analg* 2005;100:490-2.**
11. **Macario A, Dexter F, Lubarsky D: Meta- Analysis of Trials Comparing Postoperative Recovery After Anesthesia with Sevoflurane or Desflurane. *Am J Health-Syst Pharm* 62:63-68, 2005.**
12. **Dexter F., Lubarsky, D: Using Length of Stay Data from a Hospital to Evaluate Whether Limiting Elective Surgery at the Hospital is an Inappropriate Decision. *J Clin Anesth* 2004 16:421-425.**
13. **Dexter F, Abouleish A, Whitten C, Lubarsky D, Epstein R: Impact of Reducing Turnover times on Staffing Costs. *Anesth Analg* 2004 98:872.**
14. **Gan TJ, Lubarsky DA, Flood EM, Thanh T, Masukopf J, Mayne T, Chen C: Patient preferences for acute pain treatment. *Br. J. Anaesth* 2004 92:681-688.**
15. **Olson, Ronald P., Schow, Adam J., McCann, Richard, Lubarsky, David A., Gan, Tong J: Absence of adverse outcomes in hyperkalemic patients undergoing vascular access surgery: [Absence de complications chez des patients hyperkaliemiques devant subir une intervention chirurgicale d'accès vasculaire]. *Can J Anesth* 2003 50:553-557.**
16. **Abouleish AE, Epstein RH, Lubarsky DA, Dexter F: Use of operating room information system data to predict the impact of reducing turnover times on staffing costs. *Anesth Analg* 2003 97:1119 - 1126.**
17. **Gan TJ, Ing RJ, Dear G, Wright D, El-Moalem HE, Lubarsky DA: How much are patients willing to pay to avoid intraoperative awareness? *J Clin Anesth* 15:108 - 112, 2003**
18. **Dexter F, Macario A, Traub RD, Lubarsky DA: Operating room utilization alone is not an accurate metric for the allocation of operating room block time to individual surgeons**

with low caseloads. *Anesthesiology*, May 2003 98:5.

19. Abouleish AE, Dexter F, Epstein RH, Lubarsky DA, Whitten CW, Prough DS: Labor costs incurred by anesthesiology groups due to operating rooms not being allocated and cases not being scheduled to maximize operating room efficiency. *Anesth Analg* 2003;96:1109 - 1113.
20. Schow AJ, Lubarsky DA, Gan TJ: Can succinylcholine be safely used in hyperkalemic patients? *Anesth Analg* 2002 95:119-122.
21. Dexter F, Blake JT, Penning DH, Lubarsky DA: Calculating a potential increase in hospital margin for elective surgery by changing operating room time allocations or increasing nursing staffing to permit completion of more cases. *Anesth Analg* 2002 94:138-142
22. Dexter F, Lubarsky DA, Blake JT: Sampling error can significantly affect measured hospital financial performance of surgeons and resulting operating room time allocations. *Anes Analg* 95:184-188, 2002.
23. Dexter F, Blake JT, Penning DH, Sloan B, Chung P, Lubarsky DA: Use of linear programming to estimate impact of changes in a hospital's operating room time allocation on perioperative variable costs. *Anesthesiology* 2002; 96:718-724.
24. Dexter F, Gan TJ, Naguib M, Lubarsky DA: Cost identification analysis for succinylcholine. *Anesth Analg* 92:693-699, 2001.
25. Dexter F, Macario A, Lubarsky DA: The impact on revenue of increasing patient volume at surgical suites with relatively high operating room utilization. *Anesth Analg* 92:1215-1221, 2001.
26. Gan TJ, Sloan F, Dear G, El-Moalem H, Lubarsky DA: How much are patients willing to pay for avoidance of postoperative nausea and vomiting? *Anesth Analg* 92:393-400, 2001.
27. Bell ED, Penning DH, Cousineau EF, White WD, Hartle AJ, Gilbert WC, Lubarsky DA: How much labor is in a labor epidural? Manpower cost and reimbursement for an obstetric analgesia service in a teaching institution. *Anesthesiology* 92:851-8, 2000.
28. Hill RP, Lubarsky DA, Phillips-Bute B, Fortney JT, Creed MR, Glass PSA, Gan TJ: Cost-effectiveness of prophylactic antiemetic therapy with ondansetron, droperidol, or placebo. *Anesthesiology* 92:958-67, 2000.
29. Lubarsky DA, Fisher SD, Slaughter TF, Green CL, Lineberger CK, Astles JR, Greenberg CS, Inge III WW, Krucoff MW: Myocardial ischemia correlates with reduced fibrinolytic activity following peripheral vascular surgery. *J Clin Anesth* 12:136-41, 2000.
30. Lubarsky DA, Reves JG: Using Medicare multiples results in disproportionate reimbursement for anesthesiologists compared to other physicians. *J Clin Anesth* 12:238-241, 2000.
31. Dexter F, Macario A, Manberg PJ, Lubarsky DA: Computer simulation to determine

how rapid anesthetic recovery protocols to decrease the time for emergence or increase the phase 1 postanesthesia care unit bypass rate affect staffing of an ambulatory surgery center. *Anesth Analg* 88:1053-1063, 1999.

32. Dexter F, Macario A, Lubarsky DA, Burns DD: Statistical method to evaluate management strategies to decrease variability in operating room utilization: Application of linear statistical modeling and Monte-Carlo simulation to operating room management. *Anesthesiology* 91:262-274, 1999.
33. Dexter F, Macario A, Traub RD, Hopwood M, Lubarsky DA: An operating room scheduling strategy to maximize the use of operating room block time: computer simulation of patient scheduling and survey of patients' preferences for surgical waiting time. *Anesth Analg* 89:7-20, 1999.
34. Zhou J, Dexter F, Macario A, Lubarsky DA: Relying solely on historical surgical times to estimate accurately future surgical times is unlikely to reduce the average length of time cases finish late. *J Clin Anesth* 11:601-605, 1999.
35. Dexter F, Lubarsky DA, Gilbert BC, Thompson C: A method to compare costs of drugs and supplies among anesthesia providers: A simple statistical method to reduce variations in cost due to variations in case mix. *Anesthesiology* 88:1350-1356, 1998.
36. Dexter F, Penning DH, Lubarsky DA, DeLong E, Sanderson I, Gilbert BC, Bell E, Reves JG: Use of an automated anesthesia information system to determine reference limits for vital signs during cesarean section under general or spinal anesthesia: Application to medical malpractice claims. *J Clin Monit Comput* 14:491-498, 1998.
37. Lineberger CK, Lubarsky DA: Con: General anesthesia and regional anesthesia are equally acceptable choices for carotid endarterectomy. *J Cardiothorac Vasc Anesth* 12:115-117, 1998.
38. Pisetsky MA, Lubarsky DA, Capchart BP, Lineberger C, Reves JG: Valuing the work performed by anesthesiology residents and the financial impact on teaching hospitals of a reduced anesthesia residency program size. *Anesth Analg* 87:245-254, 1998 [published erratum appears in *Anesth Analg* 1998 Nov;87(5):1031].
39. Coleman RL, Sanderson IC, Lubarsky DA: Anesthesia information management systems as a cost containment tool. *CRNA* 8(2): 77-83, 1997.
40. Lubarsky DA, Glass PSA, Ginsberg B, Dear G de L, Dentz ME, Gan TJ, Sanderson IC, Mythen MG, Dufore S, Pressley CC, Gilbert WC, White WD, Alexander ML, Coleman RL, Rogers MC, Reves JG: The successful implementation of pharmaceutical practice guidelines: Analysis of associated outcomes and cost savings. *Anesthesiology* 86:1145-1160, 1997.
41. Lubarsky DA, Sanderson IC, Gilbert WC, King KP, Ginsberg B, Dear G de L, Coleman RL, Pafford TD, Reves JG: Using an anesthesia information management system as a cost containment tool: Description and validation. *Anesthesiology* 86:1161-1169, 1997.
42. Astles JR, Lubarsky DA, Loun B, Sedor FA, Toffaletti JG: Pneumatic transport exacerbates interference of room air contamination in blood gas samples. *Arch Path Lab*

Med 120(7):642-647, 1996.

43. **Lubarsky DA:** Fast track in the post-anesthesia care unit: Unlimited possibilities? *J Clin Anes* 8:70S-72S, 1996.
44. **Dentz ME, Lubarsky DA, Smith LR, McCann RL, Moskop RJ, Inge W, Grichnik KP:** A comparison of amrinone with sodium nitroprusside for control of hemodynamics during infrarenal abdominal aortic surgery. *J Cardiothorac Vasc Anesth* 9:486-490, 1995.
45. **Hadzija BW, Lubarsky DA:** Compatibility of etomidate, sodium thiopental and propofol injections with other drugs commonly administered during induction of anesthesia. *Am J Health-Syst Pharm* 52:997-999, 1995.
46. **Lubarsky DA, Smith LR, Sladen RN, Mault JR, Reed RL:** Defining the relationship of oxygen delivery and consumption: Use of biologic system models. *J Surg Res* 58:503-508, 1995.
47. **Lubarsky DA:** Understanding cost analyses: Part 1, A practitioner's guide to cost behavior. *J Clin Anesth* 7:519-521, 1995.
48. **Astles R, Lubarsky DA, Loun B, Sedor F, Toffaletti J:** Pneumatic tube system exacerbates the effect of room air contamination. *Clin Chem* 41:155, 1995.
49. **Lubarsky DA, Hahn C, Bennett DH, Smith LR, Bredehoeft SJ, Klein HG, Reves JG:** The hospital cost (fiscal year 1991/1992) of a simple perioperative allogeneic red blood cell transfusion during elective surgery at Duke University. *Anesth Analg* 79:629-637, 1994.
50. **Moskop RJ, Lubarsky DA:** Carbon dioxide embolism during a laparoscopic cholecystectomy. *South Med J* 87:414-415, 1994.
51. **Grichnik KP, Dentz M, Lubarsky DA:** Hemodynamic collapse during thoracoscopy. *J Cardiothorac Vasc Anesth* 7:588-589, 1993.
52. **Dentz ME, Lubarsky DA:** Leontiasis ossea: an unusual presentation of a difficult airway. *Anesth Analg* 76:678-679, 1993.
53. **Lubarsky DA, Griebel JA, Camporesi EC, Piantadosi CA:** Comparison of systemic oxygen delivery and uptake with NIR spectroscopy of brain during normovolemic hemodilution in the rabbit. *Resuscitation* 23:45-57, 1992.
54. **Lubarsky DA, Gallagher C, Berend JL:** Secondary polycythemia does not increase the risk of perioperative hemorrhagic or thrombotic complications. *J Clin Anes* 3:99-103, 1991.
55. **Lubarsky DA, Kaufman B, Turndorf H:** Anesthesia unmasking benign Wolff-Parkinson-White-Syndrome. *Anesth Analg* 68:172-4, 1989.
56. **Kronenfeld MA, Lubarsky DA, Feiler M, Galloway A, Thomas SJ:** The effect of ventilation on aortic blood gases during left ventricular ejection before separation from cardiopulmonary bypass. *J Cardiothorac Anes* 3:301-304, 1989.

57. **Lubarsky DA, Kaufman B, Turndorf H:** Anesthetic care of a patient with an intracranial hemorrhage after thrombolytic therapy. *J Clin Anes* 2:276-279, 1989.

Other works, publications, and abstracts:

1. **Koniaris L, Zimmers T, Lubarsky D:** Lethal Injection Redux. *Playboy* September 2005, P54, Forum: reader Response.
2. **M. Vigoda, D. Lubarsky:** Timeliness of Documentation - Medical Legal Ramifications. (Abstract Presentation at the ASA Annual Meeting in Atlanta, October 2005) *Anesthesiology* 2005;103:A1256.
3. **M. Vigoda, D. Lubarsky:** Failure to Recognize Loss of Incoming Data While Using an Automated Anesthesia Record Keeping System Increased medical Liability Exposure. (Abstract Presentation at the ASA Annual Meeting in Atlanta, October 2005) *Anesthesiology* 2005;103:A1204.
4. **M. Vigoda, D. Lubarsky:** Unanticipated Drawbacks of Easy Access to the electronic Medical Record - Balancing Security and Availability While Preventing Unauthorized Access Attempts. (Abstract Presentation at the ASA Annual Meeting in Atlanta, October 2005) *Anesthesiology* 2005;103:A1268.
5. **M. Vigoda, J. Jacque, D. Lubarsky, F. Dexter:** Increasing QA Completion Rate is Associated with Increased Rate of Documented QA Complications. (Abstract presentation at the ASA Annual Meeting in Atlanta, October 2005) *Anesthesiology* 2005;103:A798.
6. **M. Vigoda, D. Lubarsky, E. Varga, S. Lin:** Anesthesia Information System Demonstrates Use of Intraoperative Beta Blockers in Patients "at risk" for CAD Undergoing Non-Cardiac Surgery. (Abstract presentation at the ASA Annual Meeting in Atlanta, October 2005) *Anesthesiology* 2005; 103:A1278.
7. **Candiotti K, Curia L, Rodriguez Y, Birnbach D, Lubarsky D:** CYP2D6 Frequencies in the South Florida Population as Determined by the Amplichip®CYP450 Assay. (Abstract presentation at the ASA Annual Meeting in Atlanta, October 2005) *Anesthesiology* 2005; 103:A788
8. **Candiotti K, Saltzman B, Curia L, Rodriguez Y, Lubarsky D:** A Comparison of Different Types of HAZMAT Respirators by Anesthesiologists. (Abstract presentation at the ASA Annual Meeting in Atlanta, October 2005) *Anesthesiology* 2005; 103:A1194.
9. **K. Candiotti, A. Kamat, F. Nhuch, D. Lubarsky, D. Birnbach:** Treating PONV Ondansetron Prophylaxis Failures: A Comparison of Redosing with Ondansetron vs. Granisetron. (Abstract presentation at the IARS 79th Clinical and Scientific Congress in Honolulu, Hawaii, March 11 - 15, 2005).
10. **Lubarsky D:** Financial Implications of a Hospital's Specialization in Rare Physiologically Complex Surgical Procedures. (Poster presentation at the ASA Annual

Meeting in Las Vegas, NV, October 2004) *Anesthesiology* 2004; 101:A1409.

11. Estacio R, Lubarsky D, Barach P: Cardiac Arrest and Death during Anesthesia Secondary to Iatrogenic Hyperkalemia: Case Report and Database Review. (Poster presentation at the ASA Annual Meeting in Las Vegas, NV, October 2004) *Anesthesiology* 2004; 101:A1287.
12. Vigoda M, Gencorelli F, Lin S, Lubarsky D, Birnbach D: Anesthesia Information System Helps Identify Missed Opportunities for Perioperative Beta Blockade. (Abstract presentation at the ASA Annual Meeting in Las Vegas, NV, October 2004) *Anesthesiology* 2004; 101:A1378.
13. Vigoda M, Gencorelli F, Lin S, Birnbach D, Lubarsky D: Anesthesia Information System Demonstrates inadequacy of Perioperative Beta Blocker Therapy. (Abstract presentation at the ASA Annual Meeting in Las Vegas, NV, October 2004) *Anesthesiology* 2004; 101:A1381.
14. Candiotti K, Nhuch F, Kamat A, Lubarsky D, Birnbach D: Pharmacogenomics Affects Postoperative Nausea and Vomiting: The Effects of CYP2D6 Allele Frequency on Ondansetron Prophylaxis Failure. (Abstract presentation at the ASA Annual Meeting in Las Vegas, NV, October 2004) *Anesthesiology* 2004; 101:A1611.
15. Macario A., Lubarsky D: The Impact of Desflurane and Sevoflurane on the Risk of Postoperative nausea and vomiting: a systematic review of the published literature. (Abstract presentation at the IARS 78th Clinical and Scientific Congress, Tampa, Florida, March 2004).
16. Donnelly AJ, Macario A, Lubarsky DA: Pharmacoeconomics of Inhaled Anesthetics. (Special Report Activity, ICPME accredited, McMahon Publishing Group, February 2004.
17. Candiotti KA, Lubarsky DA, Kamat A, Restler C: Implementation of Granisetron 0.1mg for Prophylaxis of P.O.N.V. (Poster Presentation at the American Society of Healthcare Pharmacists meeting in New Orleans, December 8-10, 2003).
18. Breslin D, Lubarsky D, Hopkins M, Gan TJ: Delayed Discharge from the Post Anesthetic Care Unit. An Ongoing Improvement Process. (Abstract presentation at the ASA Annual Meeting, San Francisco, California, October 2003) *Anesthesiology* 2003; 99:A1136.
19. Epstein RH, Dexter F, Abouleish AE, Whitten CW, Lubarsky DA: Cost Savings from Reducing Turnover Time Result From Reductions in Surgical OR Allocations, Not Less Overtime. (Abstract presentation at the ASA Annual Meeting, San Francisco, California, October 2003) *Anesthesiology* 2003; 99:A1346.
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21. Dexter F, Lubarsky DA, Uncertainty in the Operating Rooms in Which Cases are Performed Has Little Effect on Operating Room Allocations and Efficiency (Award Winning Abstract Presentation at the AACD 15th Annual Meeting, Orlando, Florida, October 13, 2002).
- 22.

23. Dexter F, Lubarsky DA. Anesthesia Groups with Exclusive Contracts can Quantify the Cost of Operating Rooms Not Being Allocated and Cases Not Being Scheduled to Maximize Operating Room Efficiency (Award Winning Abstract Presentation at the AACD 15th Annual Meeting, Orlando, Florida, October 13, 2002).
24. Gan TJ, Lubarsky DA. Main causes of delay in-patient discharge from PACU in a major teaching hospital. (Abstract Presentation at ASA Annual Meeting, Orlando, FL, October 2002) *Anesthesiology* 2002;96:A1136.
25. Lubarsky DA, Reves J. Straightening out RVU Formulas (letter). *ASA Newsletter*. June 2002.
26. Schow AJ, Lubarsky DA, Gan TJ: Can succinylcholine be safely used in hyperkalemic patients? (Abstract Presentation at the 2001 ASA Annual Meeting) *Anesthesiology* 2001;95:A1009.
27. Olson RP, Schow AJ, Gan TJ, Lubarsky DA. Vascular Access Surgery in Hyperkalemic Patients. (Abstract Presentation at the 2001 ASA Annual Meeting) *Anesthesiology* 2001;95:A1195.
28. Gan T, Dear G, Wright MD, El-Moalem H, Sigl J, Lubarsky DA. Patient Willingness to pay for avoidance of anesthesia related postoperative outcomes. (Poster Presentation at the IARS 75th Clinical and Scientific Congress, March 16-20, 2001).
29. Wright D, Lubarsky DA, Dear G, Sigl J, Reeves J, Gan T. Willingness to pay to avoid intra-operative awareness. (Poster Presentation at the IARS 75th Clinical and Scientific Congress, March 16-20, 2001).
30. Gan TJ, Lubarsky DA: Cost effectiveness ratio: an often misunderstood term (letter). *Anesth Analg* 88(5):1191-2, 1999
31. Petros KO, Knudsen NK, Sebastian MW, Lubarsky DA. Impact of education and practice guidelines for propofol use in the surgical intensive care unit. (Poster Presentation at ACCP/ESCP 1st International Congress on Clinical Pharmacy, Orlando, FL, April 1999) *Pharmacotherapy* 19(4):P350, 1999.
32. Lubarsky DA, DeLong ER: The impact of choice of muscle relaxant on postoperative recovery time. *Anesth Analg* 87:499-500, 1998.
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34. Dear GdeL, King KP, Gilbert WC, Lubarsky DA: Is it possible to maintain drug cost savings: a two year follow-up report. *Anesthesiology* 89:A1352, 1998.
35. DeLong ER, Kwatra MM, Gan TJ, Glass PSA, Sanderson IC, Gilbert WC, Coleman RL, Lubarsky DA, Reves JG: A large population study reveals reduced anesthetic requirements in females. *Anesthesiology* 89:A126, 1998.
36. DeLong ER, Kwatra MM, Gan TJ, Glass PSA, Sanderson IC, Gilbert WC, Coleman RL, Lubarsky DA, Reves JG: Aging profoundly decreases anesthetic requirement.

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41. **Lubarsky DA**: Response to: Bailey PL, Egan TD: The successful implementation of pharmaceutical practice guidelines? Far from convincing! *Anesthesiology* 87:1583-1584, 1997.
42. **Lubarsky DA**: Response to: Riley ET: Economic analysis of anesthetic drug use. *Anesthesiology* 87:1585-1586, 1997.
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45. **Lubarsky DA**, Gilbert W, Alexander ML, Sanderson I: Validation of the programming of an anesthesia information management system for cost calculations. *Anesthesiology* 85:A1046, 1996.
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50. Sanderson IC, Gilbert WC, **Lubarsky DA**: Cost containment using an automated anesthesia record keeper. *Anesth Analg* 82:S391, 1996.

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52. Gan TJ, Ginsberg B, Grichnik K, Sullivan F, Muir M, Lubarsky DA, Glass PSA: The use of patient-controlled analgesia to compare the efficacy of sufentanil for postoperative analgesia and its relative potency to morphine. *Anesth Analg* 80(suppl 2):S142, 1995.
53. Gan TJ, Lubarsky DA, Robertson K, Bennett D, Parrillo S, Sanderson I, Jhaveri R: The hospital cost of perioperative transfusion of a unit of red blood cells and other blood products. Presented at the Joint Congress on Liver Transplantation, London, Sept. 27-30, 1995.
54. Gan TJ, Lubarsky DA, Robertson K, Gilbert WC, Grant AP, Reves JG, Clavien P: Analysis of the variable intra-operative anesthesia costs of a liver transplant procedure. *Anesthesiology* 83:A1053, 1995.
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58. Mault J, Cilley R, Lubarsky DA, Bartlett R, Reed L: Physiologic and mathematical modeling of the oxygen delivery-consumption relationship. *Crit Care Med* 22:A105, 1994.
59. Lubarsky DA, Hahn C, Bennett DH, Smith LR, Bredehoeft SJ, Klein HG, Reves JG: The hospital cost (1992) of a simple perioperative allogeneic red blood cell transfusion. *Anesth Analg* 78:S258, 1994.
60. Dentz ME, Lineberger CK, Gilbert W, Ginsberg B, Lubarsky DA: Postoperative complications following the use of etomidate for thoracic and vascular surgery. *South Med J* 87(suppl 2):S12, 1994.
61. Lubarsky DA, Smith LR, Sladen RN, Mault JR, Reed RL: Defining the relationship of oxygen delivery and consumption: use of biologic system models. *Anesthesiology* 79:A303, 1993.
62. Lubarsky DA, Kaufman BS: Changes in lactate levels with decreased oxygen delivery and oxygen consumption under anesthesia. *Anesth Analg* 68:S171, 1989.
63. Lubarsky DA, Kaufman BS, Sharnick S, Turndorf H: The effects of induction of anesthesia on mixed venous and peripheral venous oxygen saturations. *Anesth Analg* 13:S172, 1989.
64. Lubarsky DA, Kaufman BS: Oxygen delivery under anesthesia: a prospective evaluation of 330 ML/MIN/M2 as a "critical" value. *Anesth Analg* 68:S173, 1989.

65. Lubarsky DA, Piantadosi C, Camporesi E, Griebel J: Measurement of cytochrome aa3 redox potentials by NIR spectroscopy during normovolemic hemodilution. *Anesthesiology* 71:A550, 1989.
66. Lubarsky DA, Capan L, Turndorf H: Spinal anesthesia—determination of hemodynamics by bioimpedance technique. *Regional Anesthesia* 13:S37, 1988.
67. Lubarsky DA, Sharnick S, Feiler M, Kronenfeld M: The effect of ventilation on aortic blood gases during left ventricular ejection prior to separation from cardiopulmonary bypass. Proceedings of the Society of Cardiovascular Anesthesiologists Annual Meeting, 1988.

Video presentations and other private sector publications:

1. Improving Outcomes Through Effective Management of PONV CD, Ed Source February 2005, Activity made possible through an unrestricted educational grant from Merck & Company.
2. Supportive Care for Surgical Patients: Confronting the Risks of PONV CD, PGA Annual meeting December 12 - 16, 2003, produced by Accel Healthcare Communications.
3. NMB video tape, October 12, 2003, produced by Abbott Pharmaceuticals.
4. "Permission to Be Pain Free™: Understanding Labor Epidurals," conceived, scripted and presented by David A. Lubarsky, Donald H. Penning, and Janice Henderson; produced as a joint venture between Duke University and The Informed Patient, LLC, © 1999.
5. Sevoflurane, PONV Anzemet & Zofran," (Product representative training video). Written and presented by David A. Lubarsky, produced by Abbott Video Services, September 4, 1998.
6. "The Niche for Etomidate in Current Anesthetic Practice" (2 part training tape series distributed to hospitals nationwide), produced by Abbott Laboratories, 1992.
7. "Anesthesia Insites: Midazolam," training video, scripting and appearance by David A. Lubarsky, produced by Roche Laboratories, 1992.
8. "Anesthesia Insites: Romazicon," training video, scripting and appearance by David A. Lubarsky, produced by Roche Laboratories, 1992.
9. "Clinical Uses of Esmolol: Sub-Section for Uses in Vascular Anesthesia" produced by Anaquest, Inc., 1989.
10. "Anesthesia Demands for Cardiac and Vascular Surgery. Part 1: Cardiac Surgery" by Dr. Lubarsky. BOC Health Care, 1989.
11. "Anesthesia Demands for Cardiac and Vascular Surgery. Part 2: Vascular Surgery" by Dr. Lubarsky. BOC Health Care, 1989.

Conference proceedings and newsletters:

1. **Lubarsky, DA:** New Paradigms in the Prevention of Postoperative nausea and Vomiting (PONV). Advisory board participant 59th Postgraduate Assembly in Anesthesiology (PGA), New York City, New York December 9 -13, 2005.
2. **Lubarsky, DA:** Being Part of a Multi-specialty Practice group is not a Good Financial Deal. American Society of Anesthesiologists newsletter September 2005 v. 69; 9.
3. **Lubarsky, DA:** Deriving Value from Informational Systems, New Thoughts on Using NSAIDS in Perioperative Pain Management and Post-Operative Nausea and Vomiting. 29th Annual Vail Conference in Anesthesiology, February 1-8, 2003.
4. **Lubarsky, DA:** Understanding PONV. Postgraduate Assembly 56th Meeting, December 6 - 10, 2002.
5. **Lubarsky, DA:** Main Causes of Delay in In-patient Discharge From PACU in a Major Teaching Hospital. American Society of Anesthesiologists Annual Meeting, October 12 - 16, 2002.
6. **Lubarsky DA:** Are computers useful to reduce costs in outpatient surgery? Society for Ambulatory Anesthesia (SAMBA) 15th Annual Meeting Syllabus, May 5-8, 2000.
7. **Lubarsky DA:** "Putting a Value on Pain, Suffering and Anxiety: Willingness-to-Pay Analyses"
"Pharmaceutical Practice Guidelines"; "Computerization in the OR: Electronic Medical Record"
published in the syllabus of the Scott & White Symposium, 6th Annual National Meeting, Santa Fe, NM, June 22-24, 2000 (Scott & White Hospital, Temple, TX).
8. **Lubarsky DA, Reves JG:** Using Medicare multiples results in disproportionate reimbursement for anesthesiologists compared to other physicians. Association of Anesthesia Clinical Directors (AACD) 12th Annual Meeting Syllabus, October, 1999.
9. **Lubarsky DA:** Managing perioperative drug and labor costs. Proceedings of the Society of Cardiovascular Anesthesiologists 20th annual meeting, April 24-28, 1998.
10. **Lubarsky DA:** Managing perioperative drug and labor costs. Proceedings of the Association of Anesthesia Clinical Directors Workshop on Operating Room Management, March 21-22, 1998.
11. **Dexter F, Lubarsky DA:** Managing with information: using surgical services information systems to increase operating room utilization. American Society of Anesthesiologists Newsletter 62(10):6-8, 1998.
12. **Macario A, Lubarsky DA:** Why are hospitals enamored with clinical pathways? American Society of Anesthesiologists Newsletter 62(10):9-12, 1998.
13. **Lubarsky DA:** Intravenous anesthesia is too expensive for my practice! Proceedings

of the Society for Intravenous Anesthesia annual meeting, October 16, 1998.

14. **Lubarsky DA:** Cost-effective ambulatory anesthesia: The anesthesiologist's view. In the Syllabus for the Society for Ambulatory Anesthesia (SAMBA) 12th Annual Meeting, Lake Buena Vista, FL, May 1-4, 1997.
15. **Lubarsky DA:** ICU care after vascular surgery (con). Proceedings of the Society of Cardiovascular Anesthesiologists 19th Annual Meeting, Baltimore, MD, May 11-14, 1997.
16. **Lubarsky DA:** Practice guidelines, information management and resource utilization: Buzzwords for the new millennium. Proceedings of the Association of Anesthesia Clinical Directors Annual Meeting, October 19, 1997.
17. **D'Ercole F, Lubarsky DA, Reves JG:** Duke's innovative programming of an automated anesthetic record yields information essential for economic management of anesthetic practice. North Carolina Society of Anesthesiologists Newsletter, October, 1996.
18. **Becker KE, Johnstone RE, Lubarsky DA:** Choice of anesthetic drugs and muscle relaxants. American Society of Anesthesiologists Newsletter 59(5):8-11, 1995.
19. **Cohen NH, Lubarsky DA:** Cost-effective use of technology in clinical care. American Society of Anesthesiologists Newsletter 59(8):20-22, 1995.

Electronic, world wide web, and/or internet publications:

1. **Lubarsky DA** (Chief Editor and Project Manager): Anesthesiology On-Line. (1000 Chapter Textbook in preparation for emedicine.com)
2. **Commentary:** 1997: The year in review. In AnesthesiaWeb, January, 1998.
3. **Commentary:** Notes from the SCA (Society of Cardiovascular Anesthesiologists) annual meeting. In AnesthesiaWeb, June, 1998.
4. **Commentary:** What was new at the ASA in Orlando. In AnesthesiaWeb, November, 1998.
5. **Commentary:** What I did on my fall vacation in San Diego. In AnesthesiaWeb, November 1997.

PROFESSIONAL

Funded research performed:

1. Unrestricted educational grant of \$36,00.00 on behalf of Picis for the funding of the

operational budget of the Center for Informatics and Perioperative Management (CIPM). Co-Principal Investigator with Dr. Michael Vigoda 2005.

2. Co \$10,000 University of Miami Office of the Provost - inter school development grant. Co-Principal Investigator with Dr. Michael Vigoda 2004.
3. Organon, Inc., \$36,000 clinical study and research agreement with Organon Inc. These funds will help aid their research project entitled "A Multi-Center Trial to Evaluate the Interaction of Maintenance Doses of Rocuronium with an Intubating Dose of Rapacuronium, Rocuronium, or Succinylcholine." Co-Principal Investigators: Drs. TJ Gan and David Lubarsky, 2000.
4. Aspect Medical Systems, Inc., \$22,590 research agreement to support "Willingness to Pay for Avoidance of Awareness During General Anesthesia." Co-Principal Investigators: Drs. David Lubarsky and TJ Gan, 1999.
5. Roche Laboratories, \$100,000 grant x 3 years to the Department of Anesthesiology to administer and direct AnesthesiaWeb.com: An Educational Resource for Anesthesia Providers. Dr. Lubarsky, Founder and Chair, Editorial Board 1996-present.
6. North American Dräger - Co-Principal Investigator - \$535,000 to \$1.5 million contract to develop an Anesthesia Information Management System (AIMS) for Duke University Medical Center and Health System, contracted 1998.
7. Roche - \$45,000 unrestricted grant in support of Database Use in Outcomes Research 1996
8. Glaxo-Wellcome - Principal Investigator \$25,000 project grant, "Development of Methods to Objectively Value Intangible Elements of Health Care," 1996-97.
9. Abbott Laboratories - Principal Investigator - \$35,000 research grant to determine the Cp50 of etomidate and the relationship of myoclonus to plasma levels closed in 1992-3.
10. Sanofi Winthrop Pharmaceuticals - Principal Investigator - \$10,000 research grant for the study "Comparison of Amrinone versus Nitroprusside for Hemodynamic Control and Support During Infra renal Aortic Clamping for Abdominal Aortic Aneurysm Repair," 1993.
11. Abbott Laboratories - \$45,000 educational grant for an etomidate study group, 1992.
12. Somatogen - \$13,500 educational grant to study the cost of perioperative transfusions, 1992.

Professional organizations:

- American Society of Anesthesiologists, 1988 - Present
- American Medical Association, 1988 - Present
- Association of University Anesthesiologists, 2000 - Present

- International Anesthesia Research Society, 1988 - Present
- Florida Society of Anesthesiologists, 2002 - Present
- North Carolina Society of Anesthesiologists, 1988 - 2002
- Society of Cardiovascular Anesthesia, 1991 - Present

Recent international engagements:

- Invited Speaker - Beta Blockers in Non-Cardiac Surgery: Who, What, When and Why. 20th International Congress of the Israel Society of Anesthesiologists, Tel-Aviv, Israel. September 27 - 29, 2005.
- Featured Speaker - Japanese Society of Anesthesiology, May 2004, Nagoya, Japan.
- Kagoshima University School of Medicine, Department of Anesthesiology & Critical Care, Kagoshima, Japan, May 23 - 29, 2004.
- Commissioned Training in Anaesthesiology 2002/03, Pamela Youde Nethersole Eastern Hospital, Hong Kong [by Dr. Wallace Chiu (wkychiu@ha.org.hk), Chairman, Training Subcommittee in Anaesthesiology, Hospital Authority, Hong Kong] - January 2003
 - Valuing Health Care in 2002
 - Using Information Technology in Medicine - Near Future or False hope?
- Valuing Healthcare lecture XXXIIth International Meeting of Anesthesiology and Critical Care, March 18 & 19, 2000, in Paris, France, Prof. Pierre Coriat, organizer Journées D'Enseignement Post Universitaire (JEPU) (Anesthesiology and Critical Care Conference), Paris, France, March 17-23, 2000. Invited by Dr. Pierre Coriat. Lectures: "Est-on prêt à payer la prise en charge de la douleur et de l'anxiété postopératoires?" or "Putting a value on pain, suffering and anxiety: willingness to pay?" and "Gestion informatisée des coûts des agents d'anesthésie" or "Managing perioperative drug costs using informatics."

National/state presentations, conferences, speaking and other panel engagements:

Aligning Incentives. Association of Anesthesia Clinical Directors (AACD) Workshop on Operating Room Management, March 10 - 12, 2006.

How to Get What You Want: The Art of Negotiation. Association of Anesthesia Clinical Directors (AACD) Workshop on Operating Room Management, March 10 - 12, 2006.

Southern University Department of Anesthesiology Chairs (SUDAC) Meeting, Guest Faculty, Negotiating with hospitals. March 31 - April 2, 2006.

Arizona Society of Anesthesiologists 32nd Annual Scientific Meeting, Guest Faculty, Finding Value in IT: Near Future or False Hope? February 17 - 19, 2006.

Arizona Society of Anesthesiologists 32nd Annual Scientific Meeting, Guest Faculty, Preventing PONV. February 17 - 19, 2006.

Arizona Society of Anesthesiologists 32nd Annual Scientific Meeting, Guest Faculty, Perioperative Management of the Patient Undergoing Abdominal Aortic Surgery. February 17 - 19, 2006.

SAAC/AAPD, Annual Meeting, session moderator on Training the Anesthesiologist of the Future. Saturday, November 5, 2005.

American Society of Anesthesiologists, Annual Meeting, Refresher Course on Perioperative Management of the Patient Undergoing Abdominal Aortic Surgery. October 22, 2005

American Society of Anesthesiologists, Annual Meeting, Clinical Forum on Cards Consult? Revascularization? Or Just beta-Blocker? October 25, 2005

American Society of Anesthesiologists, Annual Meeting, panel on Pharmaceuticals, Economics and Anesthesia Practice (The Use of Practice Guidelines to Minimize Drug Costs.) October 26, 2004.

American Society of Anesthesiologists, Annual Meeting, panel on Academic Anesthesiology Training Programs - Should you Secede from the Medical School to Better Meet your Academic and Clinical Missions? (Pro: You Should Secede!) October 26, 2004

American Society of Anesthesiologists, Annual Meeting, panel on Practice Management, Oct 14, 2003.

Michigan State Society of Anesthesiologists, April 26, 2003. "Cox-2 Inhibitors: Periprocedural Pain Control and Thoughts on Central Sensitization."

New York State Society of Anesthesiologists, Post Graduate Assembly, panel on the Future of Economics and Anesthesia, Dec 2002.

Panel Chair, Supporting Surgical Outcomes, dinner meeting at PGA, Dec 2002. Presentation, "The Value of PONV therapy."

Medical University of South Carolina Continuing Education Weekend, Charleston, SC, May 4-6, 2001. Lecture: "Current Concepts in Neuromuscular Blockade."

Kansas University Medical Center 51st Annual Postgraduate Symposium on Anesthesiology, Kansas City, Missouri, April 6-8, 2001. Lectures: "Where is the Value in IT?" and "Valuing Healthcare: New Approaches to Costs and Outcomes."

Committee Chair, Drug Information Association workshop in collaboration with the Duke Clinical Research Institute, "Internet Health Information Programs: Integrating Vision and Basic Business Principles," Durham, NC, April 3-4, 2000. Dr. Lubarsky, Program Committee with and Kevin A. Schulman, M.D., M.B.A. (Program Chairperson). Moderator of panel, Specialist content sites. Lecture: "Healthcare Internet Business Models that Work."

Southern University Department of Anesthesia Chairs (SUDAC), Annual Meeting.

Charleston, South Carolina, March 23-25, 2001. Lecture and discussion: "Departmental Practice Plans."

International Anesthesia Research Society 75th Clinical and Scientific Congress, Ft. Lauderdale, Florida, March 16-20, 2001. Lecture: "Valuing Health Care: New Approaches to Costs and Outcomes."

Society for Technology in Anesthesia, "STA 2001: An Information Odyssey," Scottsdale, Arizona, January 10-13, 2001. Coordinator of Panel: "Who is the Information Consumer? User Perspectives on Anesthesia Information," and Lecture "Understanding Value Creation from Information Systems Elucidates Consumers of That Information"

The University of Chicago Department of Anesthesia & Critical Care 14th Annual Conference, "Challenges for Clinicians in the New Millennium," Chicago, Illinois, December 1-3, 2000. Presentations: "Willingness to Pay: Valuing Pain, Suffering & Anxiety in Health Care" and "Understanding the Business of E-Health."

American Society of Anesthesiologists Annual Meeting, San Francisco, CA, October 15-18, 2000. Foundation for Anesthesia Education and Research (FAER) panel on "Information Overload: Data Analysis from Genes to Populations." Lubarsky's presentation: "Clinical Data: Outcomes, Cost and Quality"

Greater Atlanta Society of Anesthesiologists, New Concepts in Neuromuscular Blockade, September 14, 2000

Scott & White Symposium, 6th Annual National Meeting, Santa Fe, NM, June 22-24, 2000. Presentations:

"Putting a Value on Pain, Suffering and Anxiety: Willingness-to-Pay Analyses"

"Pharmaceutical Practice Guidelines"

"Computerization in the OR: Electronic Medical Record"

Society for Ambulatory Anesthesia (SAMBA) Annual Meeting, Washington, DC May 5-8, 2000. Participated on the panel "Managing the Costs of Ambulatory Anesthesia" moderated by Alex Macario, M.D., M.B.A. Presentation: "Are Computers Useful to Reduce Costs in Outpatient Surgery?"

Participated on the panel "Life After Residency" moderated by Peter S.A. Glass, M.B., Ch.B. Presentation: "Managing Your Money."

Committee Chair, Drug Information Association workshop in collaboration with the Duke Clinical Research Institute, Durham, NC, April 3-4, 2000: "Internet Health Information Programs: Overview and Market Opportunities." Dr. Lubarsky, Program Committee with Dr. Robert Califf, Robert Taber, Ph.D., and Kevin A. Schulman, M.D., M.B.A. (Program Chairperson)

New York State Society of Anesthesiologists 53rd Annual Post-Graduate Assembly, New York, NY. Participated on the panel: "The Year 2000: How Computers Will Improve Anesthesia," December 12, 1999. Presentation: "Anesthesia Information Management: Economic Implications."

American Society of Anesthesiologists Annual Meeting, Dallas, TX, October 12, 1999.

Panel: "Practice Management/Compliance Coding-What They Didn't Teach Us in Medical School," Peter B. Kane, M.D., Moderator. Presentation: "Income Redistribution: The Politics of Communism in the OR"

American Society of Anesthesiologists Annual Meeting, Dallas, TX, October 12, 1999. Panel on Value-Based Anesthesia, Peter Rock, Panel Moderator. Presentation: "Quality Improvement and Identification of Key Indicators: Are Electronic Record Keepers the Answer?"

Association of Anesthesia Clinical Directors 12th Annual Meeting, October 10, 1999. Abstract presentation: "Using Medicare multiples results in disproportionate reimbursement for anesthesiologists compared to other physicians."

New York State Society of Anesthesiologists 52nd Annual Post-Graduate Assembly, New York, NY. Participated on the "Fraud and Abuse" panel (Current Issues Forum) December 13, 1998. Presentation: "Making the Plan Work: How to Get Doctors to Do What They Don't Want to Do."

Value-Based Anesthesia Care Committee Panel discussion, (a committee of the American Society of Anesthesiologists), Orlando, FL, October 21, 1998. Presentation: "Anesthesia Practice Management: Practice Guideline and Clinical Pathway Development."

Association of Anesthesia Clinical Directors Panel "Practical Approaches to OR Management" at the American Society of Anesthesiologists annual meeting, Orlando, FL, October 19, 1998. Presentation: "Maximizing Use of an Anesthesia Information Management System in 1998-What's New, What's Left to Do, and Is It for YOU?"

Society for Intravenous Anesthesia (SIVA) Annual Meeting, Orlando, FL, October 16, 1998. Lecture: "Is Intravenous Anesthesia Too Expensive for My Practice?"

Society of Cardiovascular Anesthesiologists (SCA) Workshop on Perioperative Cost Management and Contract Negotiation in Cardiac Surgery, Seattle, WA, April 25, 1998. Lecture: "Managing Drug Costs in the Perioperative Period" and leading a breakout session "Managing Labor Costs in the Perioperative Period." April 27, 1998: Breakfast panel with Dr. Robert Johnstone: "Economics and the Cardiovascular Anesthesiologist."

Association of Anesthesia Clinical Directors workshop on operating room management, Phoenix, AZ, March 20-22, 1998. (Invited by Dr. William Mazzei, University of California-San Diego) Lecture: "Real World Cost Reduction."

Nashville Society of Anesthesiologists, Nashville, TN, September 25, 1997.

Pittsburgh Symposium for Nurse Anesthetists, Pittsburgh, PA, September 27, 1997.

International Anesthesia Research Society annual meeting, San Francisco, CA, March 14-18, 1997. "Anesthesia Information Management: Where Are We?" presented by J.G. Reves, M.D., Thomas E. Stanley, M.D. and the Duke Anesthesia Section on Information Systems (Dr. Lubarsky, member).

Society of Cardiovascular Anesthesiologists 19th annual meeting, Baltimore, MD, May

11-14, 1997. (Invited by Steven Frank, M.D. and Jan C. Horrow, M.D., Chair, Scientific Program Committee) Presentation: "ICU Care After Vascular Surgery (Con)."

American Association of Anesthesia Assistants national meeting, Kiawah Island, SC, May 16-18, 1997. Lectures: "The Clinical Use of Sevoflurane" and "The Niche for Etomidate in Current Anesthetic Practice."

American Society of Anesthesiologists Bi-District Meeting, New Orleans, LA, May 23-25, 1997. (Invited by Donald Harmon, M.D. of the Ochsner Hospital) Lecture: "Cost Containment in Anesthesia."

Association of Anesthesia Clinical Directors annual meeting, San Diego, CA, October 19, 1997. (Invited by Barbara DeRiso, M.D., Director of the AACD) Keynote address: "Practice Guidelines, Information Management and Resource Utilization-Buzzwords for the New Millennium."

NC Society of Anesthesiologists 1996 Annual Fall Meeting in Myrtle Beach, SC, September 20-22, 1996. Lecture: "Value Based Anesthesia: The Academic Experience."

Scott & White Memorial Hospital 5th Annual Anesthesia Update/Resident Research Day, Temple, TX, April 13, 1996. (Invited by Charles McLeskey, M.D.) Lectures: "Pharmaceutical Practice Guidelines" and "Management Controversies for the Patient at Risk for Myocardial Ischemia Undergoing Non-cardiac Surgery." After dinner keynote address: "Economics vs. Hypocrites."

American Society of Anesthesiologists annual meeting, Washington, DC, March 9-13, 1996. Poster presentation: "PACU Clinical Outcomes and Financial Savings Following a Pharmaceutical Cost Containment Program in Anesthesia Using Practice Guidelines." Association of University Anesthesiologists Satellite Symposium on Outcomes Research, Chatham, MA, May 19-21, 1996. Poster presentation: "Pharmaceutical Practice Guidelines in Anesthesia: Implementation, Cost Savings and Outcome"

American Society of Anesthesiologists annual meeting, Morial Convention Center, New Orleans, LA, October 19-23, 1996. Poster Presentation: "Sustaining Cost Savings Through Distribution Control and Individualized Feedback." Poster-Discussion Presentation: "Validation of the Programming of an Anesthesia Information Management System For Cost Calculations."

Society for Intravenous Anesthesia Fourth Annual Meeting, October 20, 1995. Topic: "Does Fast Track Recovery Have Limitless Possibilities?"

Southern University Department of Anesthesia Chairmen (SUDAC) 1995 Annual Meeting, Washington Duke Inn, Durham, NC, April 6-7, 1995. Lecture: "Cost Savings for Hospital and Department-The Duke Plan."

Dallas County Anesthesia Society, Dallas, TX, September 21, 1995.

Tejas Anesthesia, San Antonio, TX, December 7, 1995.

Greater Atlanta Society of Anesthesiologists, Atlanta, GA, November 17, 1994.

Society of Cardiovascular Anesthesiologists Breakfast Panel at the American Society of Anesthesiologists annual meeting, October 17, 1994. Topic on hemodilution: "Will It

Work? How Much Will It Cost?"

First National Duke Heart Center Conference-"Shaping the Future: Innovations in Technology, Quality, and Caring" September 22-24, 1994. Presentation: "Patients at Risk for Ischemia Going to the Operating Room for Non-Cardiac Surgery: Management Controversies"

American Society of Anesthesiologists Annual Meeting, Washington, DC, October 9-13, 1993. Poster presentation: "Defining the relationship of oxygen delivery and consumption: use of biologic system models."

American Society of Anesthesiologists Annual Meeting, New Orleans, LA, October 14-18, 1989. Poster presentation: "Measurement of cytochrome aa3 redox potentials by NIR spectroscopy during normovolemic hemodilution."

Visiting professorships, 2005:

Oklahoma University Health Science Center, Department of Anesthesiology, Oklahoma City, OK, December 15 - 16

Brookwood Medical Center, Department of Anesthesiology, Birmingham, AL, December 5 - 6

Carraway Methodist Hospital, Department of Anesthesiology, Birmingham, AL, December 5 -6

CMC Hospital, Department of Anesthesiology, Charlotte, NC, November 9 - 10

University of Kansas, Department of Anesthesiology, Wichita, Kansas, April 11 - 13

Visiting professorships, 2004:

Brigham & Women's Hospital, Department of Anesthesiology, Boston, MA, October 12

Mount Sinai School of Medicine, Department of Anesthesiology, New York, New York, October 5-7

John Hopkins University, Department of Anesthesiology, Baltimore, MD, August 26 - 27

Greater Baltimore Medical Center, Department of Anesthesiology, Baltimore, MD, August 26 - 27

Kagoshima University School of Medicine, Department of Anesthesiology & Critical Care, Kagoshima, Japan, May 23 - 29

Christiana Hospital, Department of Anesthesiology, Newark, DE, May 11 -12

Visiting professorships, 2003:

Medical College of Georgia, Department of Orthopedics, Macon, Georgia, October 7-8

Hong Kong College of Anesthesiology - lectured at all hospitals in Hong Kong. Hosted by Dr. Wallace Chiu, Pamela Youde Nettersole Eastern Hospital, Department of Anesthesiology, Hong Kong, China, January 6-10

Visiting professorships, 2002:

Washington University, Department of Anesthesiology, St. Louis, Missouri, November 5-6

Baylor University Medical Center, Dallas, Texas, May 21-22 (Grand Rounds: "NMB Update-Re-examining Succinylcholine and it's Alternatives")

University of Wisconsin, Department of Anesthesiology, Madison, Wisconsin, April 2-3

Visiting professorships, 2001:

State University of New York (SUNY) at Stony Brook, Long Island, NY, June 7-8 (Resident lecture: "Understanding Cost Concepts in the Literature" Grand Rounds: "Valuing Health Care: New Approaches to Costs and Outcomes")

University of Miami Medical Center, Department of Anesthesiology, Miami, FL, June 7
Christiana Hospital, Newark, DE, May 30

Peninsula Regional Medical Center, Salisbury, MD, May 29

St. Francis Hospital, Greenville, SC, April 30

University of Texas-Southwestern Medical Center Department of Anesthesiology, Dallas, TX, March 15-16 (Faculty lecture: "What Are Patients Willing to Pay?" Resident lecture: "What Are They Willing to Do About Nausea?")

Atlanta Medical Center Department of Anesthesiology, Atlanta, GA, February 14

Baptist Hospital Anesthesia Group, Pensacola, FL, January 31

Roper and St. Francis Hospitals, Charleston, South Carolina, January 18

Visiting professorships, 2000:

Crawford Long Hospital, Department of Anesthesiology, Atlanta, GA, November 15

St. Luke's-Roosevelt Hospital, Department of Anesthesiology, New York, NY,

November 7.

Christiana Hospital and Health System, Department of Anesthesiology, Newark, DE,
May 3.

William Beaumont Hospital, Department of Anesthesiology, Royal Oak, MI, April 12.

Visiting professorships, 1999:

University of Texas-Southwestern Medical Center, Parkland Memorial Hospital,
Department of Anesthesiology, April 28, 1999.

University of South Florida, Department of Anesthesiology, Tampa General Hospital,
Tampa, FL, April 22, 1999.

Visiting Professor, Department of Anesthesiology, Loma Linda University, Loma Linda,
CA, January 27, 1999.

Washington Hospital System, Anesthesiology Department, Washington, DC, January 19,
1999.

Rex Hospital, Department of Anesthesiology, Raleigh, NC, June 3, 1999.

Jackson Memorial Hospital, Department of Oral and Maxillofacial Surgery, Miami, FL,
March 11, 1999.

Forsyth Memorial Hospital, Anesthesia Department, Winston-Salem, NC, February 11,
1999.

The Scripps System, Anesthesia Department, San Diego, CA, January 27, 1999

Visiting professorships, 1998

St. Joseph's Hospital System, Anesthesia Department, Albuquerque, NM, November 11,
1998.

University of Michigan, Department of Anesthesiology, Ann Arbor, MI, February 25-26:
"Relational Databases, Benchmarking, Practice Guidelines and Other Buzzwords of the
New Millennium" and "Management Controversies for the Cardiac Patient Undergoing
Non-Cardiac Surgery"

St. Anthony Hospital, Denver, CO, September 28, 1998.

Olean General Hospital, Jamestown, NY, September 16, 1998.

St. Vincent's Medical Center in Worcester, MA, May 20, 1998.

Visiting professorships, 1997

Visiting Professor, Stanford University Medical Center, Department of Anesthesia,
Stanford, CA, December 3-4, 1997. (Alex Macario, M.D., M.B.A., host) Wednesday
Grand Rounds lecture: "Relational Databases, Benchmarking, Practice Guidelines and

Other Buzzwords of the New Millennium." Thursday afternoon case discussion and evening case discussion with Drs. Vitez, Navarro, Scibetta, Diachun of the Stanford faculty Health Policies Fellowship.

Fletcher Allen Health Care, M.C.H.V. Campus, Burlington, VT, November 20, 1997.

Visiting Professor, New York University Medical Center, Department of Anesthesiology, New York, NY, November 18-19, 1997. (Invited by Herman Turndorf, M.D., Chair) Guest Speaker at Morbidity & Mortality Grand Rounds. Lectured on Wednesday morning: "Relational Databases, Benchmarking, Practice Guidelines and Other Buzzwords of the New Millennium."

Newark Beth Israel Hospital, Newark, NJ, April 7, 1997.

Hackensack University Medical Center, Hackensack, NJ, April 8, 1997.

Hartford Hospital, Hartford, CT, September 4, 1997.

Rhode Island Hospital, Providence, RI, October 8, 1997.

Abbott Northwestern Medical Center, Minneapolis, MN, November 11, 1997.

Visiting Professor, Medical College of Georgia, Department of Anesthesiology, Augusta, GA, November 12, 1997. Conference presentation: "Relational Databases, Benchmarking, Practice Guidelines and Other Buzzwords of the New Millennium." Case presentation.

Doctors of the Medical Center of Columbus, St. Francis and Doctor's Hospitals, Columbus, GA, November 13, 1997.

Keynote speaker at the program "New Advances in Anesthesia," Methodist Hospital, St. Louis Park, MN, November 10, 1997.

Visiting professorships, 1996

Athens Regional and Saint Mary's Hospitals, joint Grand Rounds, Athens, GA, January 18, 1996.

Visiting Professor, Vanderbilt University Department of Anesthesiology, Nashville, TN, February 22, 1996. (Invited by Charles Beattie, M.D., Ph.D., Chairman) Facilitated a multi-departmental task force meeting. Subject: "Expense Reduction-Anesthesia Drugs." Lecture: "Pharmacoeconomics in Anesthesia."

Piedmont Hospital, Atlanta, GA, March 27, 1996.

Tampa General Hospital, Tampa, FL, May 9, 1996.

Richland Memorial Hospital, Columbia, SC, May 16, 1996.

St. Louis University Department of Anesthesiology, St. Louis, MO, August 14, 1996.

The Medical Center of Central Georgia, Macon, GA, August 22, 1996.

Visiting Professor, University of Alabama-Birmingham, Department of Anesthesiology, Birmingham, AL, September 16, 1996. Lectures: "Value Based Anesthesia: The Academic Experience" and "Management Controversies for Cardiac Patients"

Undergoing Non-cardiac Surgery”

St. John’s Hospital, Queens, NY, September 30, 1996.

Addressed regional gathering of anesthesiologists, Ritz-Carlton Hotel, Boston, MA, May 19, 1996.

Addressed regional gathering of anesthesiologists, The Plaza Hotel, New York, NY, June 9, 1996.

Addressed regional gathering of anesthesiologists, Baltimore, MD, June 30, 1996.

American Association of Nurse Anesthetists national meeting to discuss practice and reimbursement issues when CRNAs and anesthesiologists are working together, Rosemont, IL, September 12, 1996

Visiting professorships, 1995

Baylor University Medical Center, Dallas, TX, September 20, 1995.

Mercy Hospital, Pittsburgh, PA, November 1, 1995.

Visiting Professor, University of Medicine and Dentistry of New Jersey, Robert Wood Johnson Medical School, New Brunswick, NJ, November 8, 1995. Lecture: “Management Controversies for the Patient at Risk for Myocardial Ischemia Undergoing Non-cardiac Surgery”

Visiting professorships, 1994

Deaconess Hospital, Boston, MA

Maine Medical Center, Department of Anesthesiology, Portland, ME, August 4, 1994.

Bronx-Lebanon Hospital Center, Department of Anesthesiology, Bronx, NY, November 30, 1994.

Visiting professorships, 1993

New York University Medical Center, New York, NY

Massachusetts General Hospital, Cardiac Division, Boston, MA

University of Medicine and Dentistry of New Jersey, Newark, NJ

Wake Medical Center, Raleigh, NC

Saint Barnabas Hospital, Livingston, NJ

Sutter Hospital, Sacramento, CA

Christiana Hospital, Wilmington, DE

Brandywine Regional Medical Center, Coatesville, PA

Englewood Hospital, Englewood, NJ

Non-physician presentations, 2001

Dräger Global Management Team Meeting, at the R. David Thomas Center of the Fuqua School of Business, Duke University, February 1, 2001. Presentation: "The Value of Information Technology."

Chair, Roche Pharmaceuticals, Advisory panel on PONV, Miami FL Dec 2001.
"Understanding the pharmacoeconomics of PONV agents"

Pain Management Advisory Board, Pfizer/Pharmacia

Non-physician presentations, 2000

Chair, Pharmacoeconomic Council on Neuromuscular Blocking Agents Retreat, Organon, Inc., St. Thomas, VI, May 19-21, 2000

Remifentanyl Advisory Board, Abbott Laboratories, Chicago, IL, May 12-13

Vertebrae Medical Advisory Board (an Internet company to support web-medicine), Westchester, NY, May 12

Cox-II/Parecoxib - U.S. Health Outcomes Advisory Group Meeting, Searle, Chicago, IL, April 24-25

Dexmedetomidine Advisory Panel, Abbott Laboratories, Aventura, FL, March 3-5

Trainer, Abbott Laboratories Perioperative Services Meeting, Dallas, TX, February 6

AnesthesiaWeb Position Strategy Meeting, New York, NY, January 12.

Other presentations, 1998

"The Impact of Inhalation Agents on Global Cost," Cog Hill Golf and Country Club, Lemont, IL, September 4, 1998.

Addressed the North American Dräger national sales meeting, Philadelphia, PA, March 29, 1998. Lecture: "Anesthesia Information Systems of the New Millennium."

Addressed the Abbott Laboratories national sales training meeting, Ft. Lauderdale, FL, February 3, 1998. Lecture: "The Economics of Postoperative Nausea and Vomiting."

Non-physician presentations, 1997

Addressed Abbott Laboratories national product development group, Chicago, IL, March 24, 1997. Lectures: "Types of Studies to Determine Cost Justification" and "Economic

Trends and Issues in Health Care Related to Anesthesia.”

Addressed Abbott Laboratories national sales training meeting, Chicago, IL, July 27-30, 1998. Lectures: “Clinical Implications of Package Insert Changes” and “Cost Perspectives: Low Flow Sevoflurane.”

Non-physician presentations, 1996

Panama City, FL, March 6, 1996.

Addressed the Amidate® (etomidate) Advisory Board of Abbott Laboratories, meeting in Washington, DC, March 8, 1996. Lecture: “General Cost Concepts and Cost Justification for Etomidate”

Addressed the Abbott Laboratories Sevoflurane Speakers Development Meeting, Hotel Sofitel, Rosemont, IL, May 17-18, 1996. Lecture: “The Cost Justification for Sevoflurane.”

Other presentations, 1994

Lectured at the Osler Anesthesiology Review Course, Ft. Lauderdale, FL, February 14-15, 1994. Lectures: “Trauma,” “How to Take the Written Boards,” “How to Take the Oral Boards,” “Anesthesia for Carotid Endarterectomy,” “A Comparison of Induction Agents,” “Management Controversies,” “Answering Strategies for the Oral Boards”.

Other presentations, 1993

Lectured at the Osler Anesthesiology Review Course, Chicago, IL, August 9-14, 1993. Lectures: “Recovery Room,” “Answering Strategies for the Board Exams,” “The Induction Agent for the Boards,” “Carotid Endarterectomy,” “Pre-operative Evaluation I,” “How to Take Board Exams,” and “Pre-operative Evaluation II.”

Lectured at the Osler Anesthesiology Review Course, Tampa, FL, January, 1993. Lecture: “How to Take the Oral Board Exam.”

Editorial and review board positions:

1. Co - Editor-in-chief of Anesthesiology , the electronic anesthesia textbook on emedicine.com. Under construction.
2. AnesthesiaWeb, a World Wide Web site developed for the anesthesia community (accumulated 16,000 subscribers, the largest anesthesia e-magazine in the world), Chair, Editorial Board, October 1996-2002.
3. Journal of Clinical Anesthesia, Section Editor, Cost Containment and Operations Improvement, 1995-present.

4. **Labarsky, DA:** Abstract Reviewer on Economics, Education and Patient Safety. 77th and 78th Annual IARS Congress, March 27 - 31, 2004
5. **Journal of Clinical Monitoring and Computing,** Section Editor, Information Systems, 1999-2002
6. **Anesthesiology,** Guest Reviewer, 1996-present.
7. **Anesthesia and Analgesia,** Guest Reviewer, 1991-present.
8. **Cardiovascular and Thoracic Anesthesia Journal Club Journal -** Section Editor, Vascular Anesthesia, 1996-1999.
9. **Anesthesia Cost Containment** bulletin board on the Internet, Coordinator and Initiator, 1995.
10. **TranspO2rt,** Contributing Editor, 1993-1994.
11. **Butterworths Publishing Company,** Boston, Guest Reviewer of anesthesia texts, 1991-93.

Teaching

Awards:

- Medical Student "Teacher of the Year" Award, 1990.
- Fuqua Scholar Award, 1999.

Teaching specialization:

- Mentor to cost effective care clerkship
- Annual advisee to multiple residents

Lectures for Fuqua School of Business Course "Informatics, the internet, and healthcare"

Fall 2000, Term I (Course repeated with update Fall 2001, Term I)

- "Informatics, The Internet and Healthcare: Introduction and Overview," August 28
- "IT Development and Value," "EMR Ideals and Recap," "Functionality of Other HIS," August 31
- "Resource Utilization Control Using Informatics Systems," September 4
- "The Medicallogic Business Model - ROI for EMR," Sept. 7
- "Introduction to The Internet," and B2B business exchanges September 11
- "MD2MD Texts, Journals, CME and Intellectual Property," September 14
- "The Regulatory Environment," September 18
- "Content Sites," Sept 21
- "Medical Care Over the Internet," Sept 28

Spring 2001, Term 3

- "Operations Management Seminar, Department of Operations: Healthcare and Management Science," March 5

University Lectures

University of Miami - School of Medicine Educational Lectures 2002

Duke University Medical Center Educational Lecture, 2001

- Resident Lecture: "How to Value Health Care."
- Medical Student 2nd year Medical Practice in Health Systems (MPS 206C.82) Lectures, "Understanding Cost Concepts in the Literature."

Duke University Medical Center Educational Lectures, 2000

- Resident Lecture: "Management Controversies for the Patient At-Risk for Myocardial Ischemia Undergoing Non-Cardiac Surgery."
- Medical Student 2nd year Medical Practice in Health Systems (MPS 206C.82) Lectures, "Understanding Cost Concepts in the Literature."

Duke University Medical Center Educational Lectures, 1999

- Anesthesiology Resident Lecture, "Contracts, Reimbursement, and Compliance Issues"
- CA-1 Resident Orientation Lecture, "PACU Issues and Transport"
- Medical Student 2nd year Medical Practice in Health Systems (MPS 206C.82) Lectures, "Understanding Cost Concepts in the Literature."

Duke University Medical Center Educational Lectures, 1998

- Medical Student 2nd year Medical Practice Health Systems Lecture, "Understanding Cost Concepts in the Literature"
- CA-1 Resident Orientation Lecture, "PACU Issues and Transport"
- Resident Lecture, "Preparing for the Oral Boards"
- Medical Student 2nd year Medical Practice Health Systems Lecture, "Understanding Cost Concepts in the Literature"
- Resident and Residency Graduate All-day Seminar, "Preparing for the Anesthesia Orals"

Duke University Medical Center Educational Lectures, 1997

- Grand Rounds, "Relational Databases, Benchmarking, Practice Guidelines and Other Buzzwords of the New Millennium"
- Anesthesiology Resident Lecture, "Understanding Cost Concepts in the Literature: Part 2"
- Medical Student 2nd year Medical Practice Health Systems Lecture, "Understanding Cost Concepts in the Literature"
- Anesthesiology Resident Lecture, "Understanding Cost Concepts in the Literature: Part 1"

- Resident Lecture, "Controversies in Care of the Patient with Coronary Artery Disease for Non-cardiac Surgery"
- Resident and Residency Graduate Weekend Seminar, "Preparing for the Anesthesia Orals"
- Medical Student 2nd year Medical Practice Health Systems Course (previously called the Cost-Effective Care Clerkship), Lecture, "Understanding Cost Concepts in the Literature"
- Resident Lecture, "Common PACU Problems"
- Medical Student 2nd year Cost Effective Care Clerkship Lecture, "Understanding Cost Concepts in the Literature"
- CRNA Staff Meeting Presentation, "New Medicare Teaching Physician Rules: How They Affect the Anesthesia Care Team"
- Resident and Residency Graduate Weekend Seminar, "Preparing for the Anesthesia Orals"
- Medical Student 2nd year Cost Effective Care Clerkship Lecture, "Understanding Cost Concepts in the Literature"

Duke University Medical Center Educational Lectures, 1996

- Medical Student 2nd year Cost Effective Care Clerkship Lecture, "Understanding Cost Concepts in the Literature"
- Resident and Residency Graduate Weekend Seminar, "Preparing for the Anesthesia Orals"
- Resident Lecture, "Common Problems and Decision Making"
- Departmental Grand Rounds, "Morbidity and Mortality"
- Medical Student 2nd year Cost Effective Care Clerkship Lecture, "Understanding Cost Concepts in the Literature"
- Departmental Grand Rounds, with Dr. JG Reves, Department Chairman, "The New HCFA (Medicare) Guidelines"
- Resident lecture, "New Medicare Teaching Rules—How They Affect You, the Resident." (Short presentation followed by Question & Answer Session on the Introduction of New Departmental Policies)
- Departmental Grand Rounds, "Cost Containment"
- Resident Lecture, "Preoperative Evaluation of the Cardiac Patient for Non-Cardiac Surgery"
- Medical Student 2nd year Cost Effective Care Clerkship Lecture, "Understanding Cost Concepts in the Literature"
- Medical Student 2nd year Cost Effective Care Clerkship Lecture, "Understanding Cost Concepts in the Literature"
- Critical Care Grand Rounds, "Cost Containment in the ICU"

Duke University Medical Center Educational Lectures, 1995

- Medical Student 2nd year Cost Effective Care Clerkship Tutorial Sessions
- Anesthesiology Resident Lecture, "Common Problems in Anesthesia"
- Medical Student 2nd year Cost Effective Care Clerkship Lecture, "Understanding Cost Concepts in the Literature"
- Anesthesiology Resident Lecture, "Common Problems in Anesthesia"
- Grand Rounds in Family Medicine, "Understanding Cost Concepts in the Literature"

- Anesthesiology Resident Lecture, "Board Review"
- Medical Student 2nd year Anesthesiology Rotation Lecture, "Hemodynamic Monitoring"

Duke University Medical Center Educational Lectures, 1994

- Current Topics in Vascular & Thoracic Anesthesia (CME Category 1 departmental conference), "Prevention of Endotracheal Tube-Induced Coughing During Emergence from General Anesthesia" with Dr. Daryl Malak
- CA-1 Resident Orientation Lecture, "Recovery Room Problems (& Transport): Basic Clinical Problem Solving"
- Current Topics in Vascular & Thoracic Anesthesia (CME Category 1 departmental conference), "Infection Control in Anesthesia" with Dr. Josef Grabmayer
- Anesthesiology Resident Lecture (Vascular & Thoracic Series), "Management Controversies for the Patient at Risk for Myocardial Ischemia Undergoing Non-cardiac Surgery"
- Current Topics in Vascular & Thoracic Anesthesia (CME Category 1 departmental conference), "Cell Saver: To Use or Not to Use?" with Dr. Nancy Knudsen

National board review courses (Invited lectures given multiple times 1991-1995):

"How to Take the Oral Board Exam"
 "Carotid Endarterectomy"
 "Oral Exam Answering Strategies"
 "Pre-operative Evaluation-History and Physical Exam"
 "Pre-operative Evaluation-Labs and Tests"
 "Written Questions and Answers"
 "Recovery Room-Differential Diagnoses and Therapies for Common Clinical Problems"
 "Induction Agents for the Boards"
 "Trauma Anesthesia"

SERVICE

Committees and offices:

Florida Society of Anesthesiologists:

FSA Board Member 2003

Ad hoc non-voting Board invitee 2002 - 2003

American Society of Anesthesiologists (ASA)

ASA Delegate for FSA, 2003

Committee on Economics 2003- present

Committee on Information Management 2002-3

Committee on Electronic Media and Information Technology, 2001-2.

Committee on Value Based Anesthesia Care 1995-1999

Task Force on Value-Based Anesthesia 1994 - 1995

Ad Hoc Committee on Health Outcomes in Anesthesia, chaired by Alex Macario, M.D., M.B.A. (October, 1997 - present)

University of Miami-School of Medicine

Chair, Department of Anesthesiology overseeing 25MM annual budget, 300 employees

including 130 interns, residents and fellows, the largest training program in the world.
Medical Center Internet Group Chief Search 2002-2003
Governing Board 2001-present

Duke University Medical Center and Health System

Duke University Hospital, Perioperative Executive Committee, 2000 - 2002.

Duke University Health System/Duke University Medical Center Internet Advisory Committee, 2000 - 2002.

Managed Care Committee (PDC = Private Diagnostic Clinic = 850 MD partnership) and PDC representative to Managed Care Coordination Group (Duke University Health System and PDC) 2001-2002.

Private Diagnostic Clinic Business Strategy Committee, 1999 - 2002.

Steering Committee, Duke University Health System Revenue Management Initiative, October, 1999 - 2002.

Organizer, Duke University Medical MBA's (an internal consulting group for the Duke University Health System), 1999.

Physician Co-Director, Private Diagnostic Clinic (HCFA/CMS) Compliance Committee, March, 1997 - 2002.

Administration and Citizenship Work Group, managed by Provider Transition Strategies, LLC, charged with implementing a physician performance improvement system within the Duke Health System, February, 1998 - February, 1999.

Perioperative Services Advisory Committee, 1997 - 2002.

Faculty of Medical School cost-effective care course, 1995 - 2002.

Private Diagnostic Clinic Retirement Trust Plan Committee, representing the Departments of Anesthesiology, Pathology, Radiation Oncology and Radiology, 1995 - 2002.

Product Standardization Committee, Departmental Representative, May, 1995 - 1996.

Medical Center Cost Effectiveness Committee, January, 1995 - 2002.

Task Force on Teaching Cost Effectiveness, April, 1994 - June, 1995.

Duke Hospital Operations Improvement Steering Committee, 1994 - 1996.

Operating Room Mission Statement Committee, 1994.

Pharmacoeconomics Committee, 1994.

Liaison to Operating Room Clinical Laboratories, 1994 - 2002.

Task Force to Choose Managed Care Partners, 1994.

Duke University Medical Center, Hospital Budget Advisory Committee and Capital Equipment Committee, 1991 - 1994.

Duke Department of Anesthesiology

Chairman, Finance Committee, January, 1991-2002.

Chairman, Equipment, Supplies, and Product Standardization Committee, 1996-2002.

Coordinator, Practice Guidelines Development, 1994-2002.

Coordinator, Drug Utilization Review, 1995-2002.

Director, Outside Hospital Anesthesia Service Contracts, 1996-2002.

Physician Director of Reimbursement Analysts, 1996-2002.

Departmental Compliance Officer

Developer of departmental wide staffing model & incentive plans

Direct supervision of business office and business manager

Chief, Division of General/Vascular/Transplant Anesthesia and Surgical Critical Care Medicine (12 attendings, 10 CRNAs, 2-4 residents, 2-4 fellows, 8 PA's in preop screening unit) 1998-2002

Coordinator/creator, Current Topics in Vascular and Thoracic Anesthesia, a weekly CME Category 1 approved conference, July 1991-July 1998.
Director, Departmental Retreat, July 1994, "Upping the Pace of ACE (Anesthesia Cost Effectiveness)".
Resident Education Committee, 1991-1994.
Director, Mock Oral Board Review Course, 1989-2002.

Appendix A

Electronic, World Wide Web and/or Internet Publications:

List of all literature reviews done for AnesthesiaWeb (<http://www.anesthesiaweb.com>)

1. Literature review: Dexter F et al: Decreases in anesthesia-controlled time cannot permit one additional surgical operation to be reliably scheduled during the workday. *Anesth Analg* 81:1263-8, 1995 in AnesthesiaWeb, November, 1996
2. Literature review: Dexter F and Tinker J: Analysis of strategies to decrease postanesthesia care unit costs. *Anesthesiology* 82:94-101, 1995 in AnesthesiaWeb, November, 1996
3. Literature review: Connors AF Jr et al: The effectiveness of right heart catheterization in the initial care of critically ill patients. *JAMA* 276:889-97, 1996 and the accompanying editorial: Should a moratorium be placed on sublingual nifedipine capsules for hypertensive emergencies and pseudoemergencies. *JAMA* 276:1328 in AnesthesiaWeb, December, 1996
4. Literature review: Mangano et al: Review of effect of atenolol on mortality and cardiovascular morbidity after noncardiac surgery. *N Engl J Med* 335:1713, 1996 and accompanying editorial, Eagle and Froelich: Reducing cardiovascular risk in patients undergoing noncardiac surgery. *N Engl J Med* 335(23):1761, 1996 in AnesthesiaWeb, January 1997
5. Literature review: Katz SG and Kohl RD: Selective use of the intensive care unit after nonaortic arterial surgery. *J Vasc Surg* 24:235-9, 1996 in AnesthesiaWeb, February, 1997
6. Literature review: Wright I et al: Statistical modeling to predict elective surgery time. *Anesthesiology* 85:1235-45, 1996 in AnesthesiaWeb, February, 1997
7. Literature review: Twersky R et al: What happens after discharge? Return hospital visits after ambulatory surgery. *Anesth Analg* 1997;84:319-24 in AnesthesiaWeb, March, 1997
8. Literature review: Blum U et al: Endoluminal stent grafts for infrarenal abdominal aortic aneurysms. *N Engl J Med* 1997;336:13-20 in AnesthesiaWeb, March, 1997
9. Literature review: Claxton AR, et al: Evaluation of morphine versus fentanyl for postoperative analgesia after ambulatory surgical procedures. *Anesth Analg* 1997; 84:509-514 in AnesthesiaWeb, April 1997
10. Literature review: Valenzuela RC, Johnstone RE: Cost containment in anesthesiology: a survey of department activities. *J Clin Anesth* 1997; 9:91-92 in AnesthesiaWeb, April 1997
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Appendix B

Editorials Accompanying Articles:

(Numbers refer to the article listed on Lubarsky's CV)

- 15 & 16. Shapiro BA: Why must the practice of anesthesiology change? It's economics, Doctor! *Anesthesiology* 86:1020-1022, 1997 and Fisher DM, Macario A: Economics of anesthesia care. A call to arms! *Anesthesiology* 86:1018-1019, 1997
- 20. Miller RD, Rampil L, Cohen N: Fewer residents: financial, educational, and practical implications. *Anesth Analg* 87:242-244, 1998
- 23. Mazzei WJ: Maximizing operating room utilization: a landmark study. *Anesth Analg* 89:1-2, 1999
- 26. Chestnut DH: How do we measure (the cost of) pain relief? *Anesthesiology* 92:643-645, 2000
- 27. Watcha MF: The cost-effective management of postoperative nausea and vomiting. *Anesthesiology* 92:931-3, 2000

Exhibit 2 to Dr. David Lubarsky 2007 Affidavit

➤ Inadequate anaesthesia in lethal injection for execution

Lancet 2005; 365: 1412-14 Leonidas G Koniaris, Teresa A Zimmers, David A Lubarsky, Jonathan P Sheldon

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Anaesthesia during lethal injection is essential to minimise suffering and to maintain public acceptance of the practice. Lethal injection is usually done by sequential administration of thiopental, pancuronium, and potassium chloride. Protocol information from Texas and Virginia showed that executioners had no anaesthesia training, drugs were administered remotely with no monitoring for anaesthesia, data were not recorded and no peer-review was done. Toxicology reports from Arizona, Georgia, North Carolina, and South Carolina showed that post-mortem concentrations of thiopental in the blood were lower than that required for surgery in 43 of 49 executed inmates (88%); 21 (43%) inmates had concentrations consistent with awareness. Methods of lethal injection anaesthesia are flawed and some inmates might experience awareness and suffering during execution.

Since 1976, when the death penalty was reinstated, 959 people have been executed in the USA.¹ Lethal injection has eclipsed all other methods of execution because of public perception that the process is relatively humane and does not violate the Eighth Amendment prohibition against cruel and unusual punishment. US courts recognise "evolving standards of decency that mark the progress of a maturing society", and prohibit punishments that "involve the unnecessary and wanton infliction of pain", "involve torture or a lingering death", or do not accord with "the dignity of man".²

Lethal injection usually consists of sequential administration of sodium thiopental for anaesthesia, pancuronium bromide to induce paralysis, and finally potassium chloride to cause death.³ Without anaesthesia, the condemned person would experience asphyxiation, a severe burning sensation, massive muscle cramping, and finally cardiac arrest. Thus, adequate anaesthesia is necessary both to mitigate the suffering of the condemned and to preserve public opinion that lethal injection is a near-painless death. By contrast with its medical applications, however, anaesthesia in execution has not been subjected to clinical trials, governmental regulation, extensive training of practitioners, standardisation, or the supervision of peer-review and medicolegal liability. Furthermore, the American Medical Association and American Nurses Association strictly oppose participation of their members in executions. We postulated that anaesthesia methods in lethal injection might be inadequate.

To assess anaesthesia methods, we sought protocol information from the states of Texas and Virginia, where 45-46% of executions are done, by a combination of statutory records requests to the Texas Department of Criminal Justice and the Virginia Department of Corrections, along with personal interviews and sworn testimony of corrections officials involved in executions. We noted that neither state had a record of the creation of its protocol (Texas Department of Criminal Justice Assistant General Counsel, January and February, 2004; and Virginia Department of Corrections Director of Communications, December, 2003; written communications); executioners—typically one to three emergency medical technicians or medical corpsmen—had no

training in anaesthesia (Virginia Department of Corrections Director of Communications, written communication; and personal interview of a former senior Texas corrections official who witnessed 219 Texas executions: hereafter "personal interview"); after placement of one or two intravenous lines, executioners stepped behind a wall or curtain and remotely administered drugs to the conscious inmate (personal interview);⁴ no direct observation, physical examination, or electronic monitoring took place for anaesthesia (personal interview);⁵ and there was no data collection, documentation of anaesthesia, or post-procedure peer review (Virginia Department of Corrections Director of Communications, written communication; and personal interview). No assessment of depth of anaesthesia or loss of consciousness was done: apparently anaesthesia is assumed because a relatively large quantity of thiopental is specified (usually 2 g) compared with the typical clinical induction dose of 3-5 mg/kg, immediately followed by 1-1.5 mg/kg per min for maintenance; this dose equates to 270-450 mg for induction and 90-135 mg/min maintenance for a 200 lb man.

The assumption that 2 g thiopental assures anaesthesia is overly simplistic, however. First, technical difficulties or procedural errors by poorly trained executioners might hinder administration of the total dose. Second, if thiopental anaesthesia were maintained at standard infusion rates, the total dose for a 10-min procedure in a 100 kg man would be 1.3-2.0 g. Thus the dose used is not excessive for the average time from injection to death (8.4 min, SD 4.7) and might be inadequate if the process took longer.⁶ Third, a person anticipating execution would be fearful, anxious, and hyperadrenergic, and would need a higher dose of thiopental than would a premedicated surgical patient. Fourth, inmates with histories of chronic substance misuse problems might have high tolerance to sedative hypnotics and would need increased doses of anaesthetic.

Because no documentation of anaesthesia in the execution chamber existed, the only available objective data were postmortem concentrations of thiopental. Texas and Virginia refused to provide such data, but we obtained autopsy toxicology results from 49 executions in

Arizona, Georgia, North Carolina, and South Carolina. Toxicology reports were generated by MedTox Laboratories (St Paul, MN) for Arizona and are available in *Beardalee versus Woodford*, No C-04-5381 (Northern District of California, 2004). Data from the Division of Forensic Sciences Georgia Bureau of Investigation are available in *State versus Nance*, Superior Court Indictment No 95-B-2461-4. North Carolina reports were obtained directly from the Office of the Chief Medical Examiner. South Carolina Law Enforcement Division Toxicology Department reports were obtained by attorney David Barron, Kentucky Department of Public Advocacy Capital Post-Conviction Unit (personal communication) and are available in *Hill versus Ozmint*, No 2:04-0489-18A (District of South Carolina, 2004). Although the protocols of all four states are similar to those of Texas and Virginia, and specify that 2 g

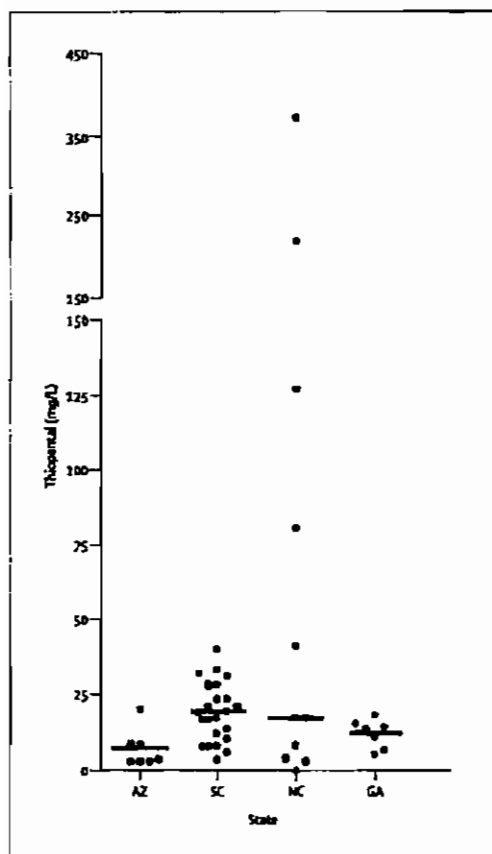


Figure 1: Individual post-mortem thiopental concentrations in blood by state. Lines show medians. Note different scales. GA sampled several sites in five individuals; the highest values are shown. GA values were reported as plus or minus 75%. AZ and SC did not report site of blood sampling. NC results were each from a single site, including subclavian artery, jugular vein, femoral vein, or vena cava.

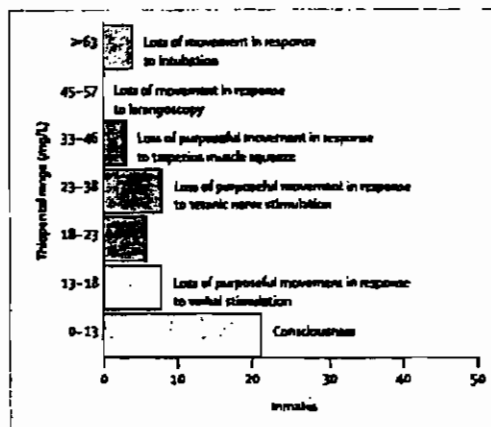


Figure 2: Number of executed inmates with post-mortem thiopental concentrations within range for indicated clinical endpoint. Ranges are 95% CI of the CD_{50} for the stimuli.

thiopental is used, concentrations of the drug in the blood ranged from only trace amounts to 370 mg/L (median 15.5 mg/L; figure 1). Thiopental concentrations did not fall with increased time between execution and blood sample collection (data not shown), consistent with data showing that thiopental is quite stable in stored human plasma.¹

Extrapolation of antemortem depth of anaesthesia from post-mortem blood thiopental concentrations is admittedly problematic. To estimate concentrations of thiopental in the brain from concentrations in the blood in life, details of the rate and duration of drug administration are needed. Unfortunately, such details are usually not specified in lethal injection protocols. Furthermore, no data about post-mortem distribution of thiopental are available. However, a large range of blood concentrations resulted from nearly identical protocols across and within individual states—from 8.2 mg/L to 370 mg/L in North Carolina for the same sampling site (subclavian artery) and similar collection times (same day or next day, respectively). This finding suggests substantial variations in either the autopsy or anaesthesia methods. Contrasting the expertise of state medical examiners with the relatively unskilled executioners, however, would strongly suggest that the variation is probably due to differences in drug administration in individual executions.

If post-mortem thiopental concentrations are taken as a surrogate marker of concentrations in the blood during life, most of the executed inmates had concentrations that would not be expected to produce a surgical plane of anaesthesia, and 21 (43%) had concentrations consistent with consciousness (figure 2). In a careful study in which actual serum thiopental concentrations were measured against clinical endpoints, the steady state serum concentration needed to produce a 50% probability of no

muscle response (Cp50) after intubation was defined as 78.8 mg/L (SD 2.9).¹ The Cp50 for movement after trapezius muscle squeeze, a stimulus equivalent to skin incision, was 38.9 mg/L (3.3). Remarkably, 43 of the 49 inmates had blood thiopental concentrations below this level. Most worryingly, 21 inmates had concentrations less than the Cp50 for repression of movement in response to a vocal command. In view of these data, we suggest that it is possible that some of these inmates were fully aware during their executions. We certainly cannot conclude that these inmates were unconscious and insensate. However, with no monitoring and with use of the paralytic agent, any suffering of the inmate would be undetectable.

With little public dialogue about protocols for killing human beings, it is pertinent to consider recommendations from animal euthanasia protocols. The American Veterinary Medical Association (AVMA) panel on euthanasia specifically prohibits the use of pentobarbital with a neuromuscular blocking agent to kill animals,² and 19 states, including Texas, have expressly or implicitly prohibited the use of neuromuscular blocking agents in animal euthanasia because of the risk of unrecognised consciousness.³ Furthermore, AVMA specifies that "it is of utmost importance that personnel performing this technique are trained and knowledgeable in anaesthetic techniques, and are competent in assessing anaesthetic depth appropriate for administration of potassium chloride intravenously. Administration of potassium chloride intravenously requires animals to be in a surgical plane of anesthesia characterized by loss of consciousness, loss of reflex muscle response, and loss of response to noxious stimuli".⁴ The absence of training and monitoring, and the remote administration of drugs, coupled with eyewitness reports of muscle responses during execution, suggest that the current practice of lethal injection for execution fails to meet veterinary standards.⁵

Our data suggest that anaesthesia methods in lethal injection in the USA are flawed. Failures in protocol design, implementation, monitoring and review might have led to the unnecessary suffering of at least some of those executed. Because participation of doctors in protocol design or execution is ethically prohibited, adequate anaesthesia cannot be certain. Therefore, to prevent unnecessary cruelty and suffering, cessation and public review of lethal injections is warranted.

Contributors

I. G. Koniaris and J. P. Sheldon conceived the study. J. P. Sheldon collected the protocol information. J. P. Sheldon and T. A. Zimmers collected the toxicology data. D. A. Labarely, I. G. Koniaris, and T. A. Zimmers assessed the protocol information and toxicology data. All authors participated in the writing and editing of the manuscript. I. G. Koniaris and T. A. Zimmers contributed equally to the work.

Conflict of interest statement

JS is an attorney who represents inmates sentenced to death. None of the other authors has a conflict of interest.

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